# A Peer-Reviewed Journal About

# RESEARCH VALUES

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**ACTIVATING VALUES**



**CHANGING VALUES**



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# EDITORIAL

# MOST AND LEAST OF RESEARCH VALUE/S

Christian Ulrik Andersen
& Geoff Cox

**APRJA Volume 7, Issue 1, 2018**
**ISSN 2245-7755**

There is value and there are values. There is the measure of wealth, metrified and calculated in numerous ways, and there are ideas, ethics, preferences of taste, and customs of ideology. That the two can be associated together is nothing new. It is easy to value values and quantify how well we like, prefer or perform values (on a scale from one to ten; and ironicized here in the reworking of this introduction by Pip Thornton). Likewise, such processes of valorization in themselves imply particular values, ideologies and ethical or aesthetical preferences (the beauty and rightfulness of valorization, wealth and surplus). But what really happens when the two are conflated? How do we understand how the values associated with something give it value; or, how giving something a value affords certain values? And, in what ways are the conflations of value and values tied to the circulation of value and values in contemporary technical infrastructures?

## Research values

The articles published in A Peer-Reviewed Journal About Research Values interrogate value and values in ways that respond to techno-cultural shifts and embrace the range of economies that pervade digital culture. These include facing value and modes of subjectivation involved in both the sharing economy as well as in the use of biometrics (Luke Munn, Mitra Azar, Lea Laura Michelsen); knowing values and the different ways of storing and regulating knowledge (Francis Hunger, César Escudero Andaluz & Martín Nadal, Maria Eriksson, Dionysia Mylonaki & Panagiotis Tigas); activating values and the ways artists and activists may potentially address the conflation of values and value in terms of cultural politics (Marc Garrett, Ashley Lee Wong, Konstanze Scheidt); and finally changing values to explore how processes of valuing and valorization seem to bend and evade fundamental relations to the world (Calum Bowden, Tega Brain).

This publication, then, also responds to the changing processes of valorization that qualify and quantify research, and follows an earlier research workshop at the Brandenburg Center for Media Studies (ZeM) in Potsdam, in which researchers exchanged ideas (and values) on face value, the theme of the 2018 edition of transmediale festival for digital art and culture in Berlin. And more precisely, the publication implicitly addresses how we may begin to think about the value and values associated with research processes and outputs?

## Value and valorization

If we are to identify two classical thinkers on processes of valorization it must be Karl Marx and Immanuel Kant. In classical Marxism, the difference between a worker's wages (exchange value) and the value of goods and services s/he produces (use value) is referred to as *surplus value* (or added value). Since use value is higher than the exchange value, workers produce a positive surplus value through their labour, and this is what is exploited by the capitalist. It's so simple and enduring. Yes and No. Indeed some processes of valorization also evade capitalist values. In philosophical terms there are different processes of valorization, or 'judgments' as put by Kant. Judgements can be used to navigate or categorize what is definitely right or wrong according to function or ethics. But there are also more reflective judgements that work the other way around, by elevating the particular subjective experience to a universal truth that is not absolute

or determinate, but open-ended and an expression of how things ought to be; shared by a community, a sensus communis.

So what are the relations between processes of (creative or academic) labour and surplus value, and processes of preferences, taste and even affect? There seems to be a shift, and to many also a crisis at play.

## Crisis of value

The so-called 'crisis of value' can be understood as the struggle for control over the forces that – paradoxically – wish to extract surplus value from processes of valorization no longer so reliant on waged work-time or the monetized economy, but more tied to reflective judgements.

To some commentators (such as Benjamin Noys) the artist has become the paradigmatic worker demonstrating the required attributes of precarity and flexibility in today's capitalist production – and thus revealing this paradox of valorization. Artistic production is, and has always been, paradigmatic here with its complex and uneasy relation to the capitalist market and of the collapse between physical and symbolic forms of value. Despite the claims to reject its commodification by capital, this seems increasingly utopian under conditions where value outside of monetization has become commonplace; where valorization is a process of never-ending creations of judgments and formations of communities. In a situation where all production is post-conceptual, artist-workers demonstrate the paradigmatic attributes of flexibility and precarity. As Noys writes:

> *"This paradox is simply stated: on the one hand, the artist is the most capitalist subject, the one who subjects themselves to value extraction willingly and creatively, who prefigures the dominant trend lines of contemporary capitalism […] on the other hand, the artist is the least capitalist subject, the one who resists value extraction through an alternative and excessive self-valorisation that can never be contained by capitalism."*

## Most and least

The most capitalist subject is the least capitalist subject at the same time, and what Marx once argued for the worker in general is exemplified by artistic production. Here lies the 'paradox of valorisation' – the most and least – and this is important for festivals for art and digital culture, like transmediale. We say this, as surely, the combination of art and digital culture is most and least contemporary capitalist production that typifies the ideological prescriptions of creative work, the use of scores, scripts, and programs, and the ways that core values have been incorporated into best and worst practices (e.g. sharing and modification). The case of open source software development and network services that have merged into centralized and monopolistic server-based platforms and services emphasizes the point (Andersen and Pold).

The paradox is clearly also important for research – as surely the researcher is a good further example of the most and least capitalist subject. Our point is to understand how research objects produce value, how they operate as exchange, and how they produce different kinds of socialities in their exchanges? What other socialities might we imagine once we recognize how value

is subsumed into more complex human-nonhuman assemblages? What kinds of value-machine imaginaries are possible that engender the most and least radical of value systems? This is responded to in this volume by researchers active in the (precarious) process of claiming value for their work.

Not least, nor most, this also points to the value of paradox itself.

Christian Ulrik Andersen & Geoff Cox
Aarhus/Plymouth, June 2018.

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Pip Thornton

# LANGUAGE REDUX

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My contribution to researching value is based around how much words are worth in a digitally networked society, and how the language we use to communicate and express ourselves has become infused – and indeed compromised – by the pervasive and invasive neoliberal market logics of proprietary tech companies such as Google. It might seem like an obvious received wisdom to say that the value of language is subjective; irreducible to – and unconstrainable by – financial quantification, and that language is not fixed – in meaning or aesthetic value – but rather it is fluid, liquid, limitlessly deferable. But these are assumptions that do not take into account the forces and logics of what Frederic Kaplan (2014; see also Bruno 2012) has called 'linguistic capitalism', whereby words are given an economic value, and auctioned to advertisers through Google's AdWords platform as tools with which to claim and colonise the prime locations on a search results page. In this way, the language that flows through digital space is not liquid at all, but is chained to an overriding economic value, irrespective of its value or worth in other contexts (Thornton 2017).


**Figure 1**

Part of my response to this commodification of language is a critique of linguistic capitalism by means of artistic intervention. As I see it, in today's digital economy, the words we submit through the platforms and portals of the web are stripped of their aesthetic, narrative value in favour of their exchange value, and this mediation of language by powerful and opaque companies such as Google has significant political, as well as cultural consequences. Language is – and has always been – a tool of power over both people and places, and we must strive to expose these tools of power whenever, and by whatever means, possible.

Most and Least of Research Value/s
by Christian, Geoff, Pip & Google

SALE

30th Jun 2018 2:05PM
BATCH #: CRC32
AUTH #: 4150522913
AREA #: ALL

| | | |
|---|---|---|
| 1 | company values examples | £11.80 |
| 1 | wealth account | £5.98 |
| 1 | jansky | £12.79 |
| 1 | possible invention ideas | £9.07 |
| 1 | independant office | £4.32 |
| 1 | penn state personality test | £5.32 |
| 1 | and antacid definition | £5.68 |
| | SUBTOTAL | £54.96 |
| | TAX: | N/A |
| | TOTAL | £54.96 |

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{poem}.py

**Figure 2**

{poem}.py is my method of making visible the workings of linguistic capitalism by feeding poetry and other texts through the valorizing systems of Google's search and advertising platforms (Thornton 2018). Google AdWords' keyword planner gives advertisers a suggested bid price for words and phrases so they can enter the market at an

appropriate price. I harvest these derivative prices, and use them to expose the contextual tensions in this linguistic economy, printing the monetised poems out as analogue receipts which become aesthetic artefacts in their own right. In this way, the {poem}.py project seeks to reclaim language from the algorithmic market, and return it to art.

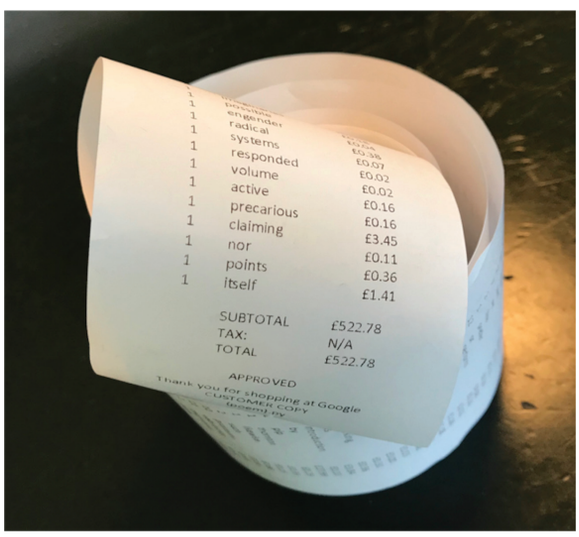



**Figure 3**

Indeed, given the subject matter (and its economic lexicon) Christian and Geoff's introduction is an interesting text to analyse in this way, so I thought it needed further investigation/visualisation. I have therefore also used the text to experiment with two further methods. My second reworking utilises another function of Google AdWords, which is to suggest alternative keywords and phrases for whatever the keyword planner thinks you might be trying to advertise. This is in effect a way to reverse engineer how Google's algorithm interprets the words we enter into the search bar. In the past I have gathered this data for poems and manually reconstructed the text into a reworked 'co-authored' poem, but this time I wanted to take a step back and let the market speak for itself. My second intervention therefore generates long-tail keyword suggestions for the individual (punctuation delineated) phrases within the opening sentences of the introduction. The first step was therefore to chop up the opening sentences and reconstruct them into a traditional poetic format[1]:

*Most and Least of Research Value/s*
*by Christian, Geoff and Pip*

*There is value and there are values.*
*There is the measure of wealth,*
*metrified and calculated in numerous ways,*
*and there are ideas,*
*ethics,*
*preferences of taste,*
*and customs of ideology.*

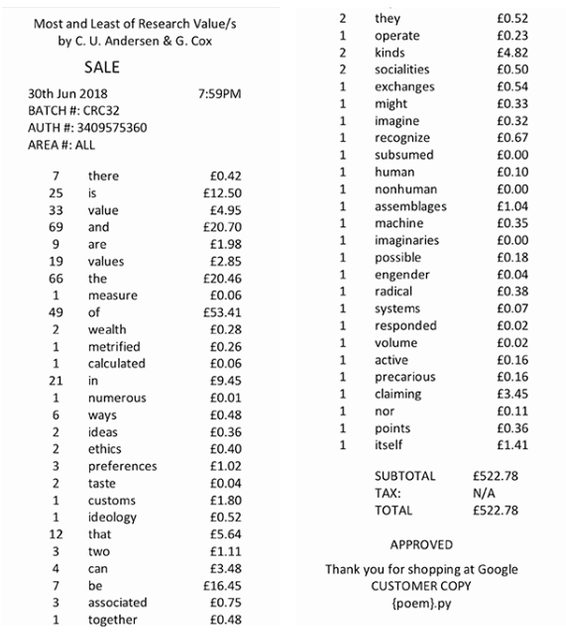
I then ran the new 'poem' through the Google AdWords keyword planner, replaced each line with the most economically valuable suggested keyword/phrase, and rewrote the poem, which came out as follows (see also Figure 2 for an image of the reworked intro-poem with suggested bid prices for top alternative keywords):

*Most and Least of Research Value/s*
*by Christian, Geoff, Pip & Google AdWords*

*Company values examples.*
*Wealth account,*
*jansky,*
*possible invention ideas,*
*independent office,*
*penn state personality test,*
*and antacid definition.*

My third reworking takes the first paragraph of the introduction, feeds each individual word through the keyword planner, and then reconstructs the text in order of monetary value. The result is a paragraph shrunken by repetition, yet structurally bloated with commercial worth. As we have seen above,

*quantify* is the most valuable word (£8.98); *rightfulness* the least (£0.00). The words in this piece are in order of suggested monetary value; all I have done is add punctuation. The result is a reworking – or re-rendering – of the text, exposing the hidden commercial influences of the words we use in our everyday lives.



Most and Least of Research Value/s
by C. U. Andersen & G. Cox

SALE

30th Jun 2018 7:59PM
BATCH #: CRC32
AUTH #: 3409575360
AREA #: ALL

| | | |
|---|---|---|
| 7 | there | £0.42 |
| 25 | is | £12.50 |
| 33 | value | £4.95 |
| 69 | and | £20.70 |
| 9 | are | £1.98 |
| 19 | values | £2.85 |
| 66 | the | £20.46 |
| 1 | measure | £0.06 |
| 49 | of | £53.41 |
| 2 | wealth | £0.28 |
| 1 | metrified | £0.26 |
| 1 | calculated | £0.06 |
| 21 | in | £9.45 |
| 1 | numerous | £0.01 |
| 6 | ways | £0.48 |
| 2 | ideas | £0.36 |
| 2 | ethics | £0.40 |
| 3 | preferences | £1.02 |
| 2 | taste | £0.04 |
| 1 | customs | £1.80 |
| 1 | ideology | £0.52 |
| 12 | that | £5.64 |
| 3 | two | £1.11 |
| 4 | can | £3.48 |
| 7 | be | £16.45 |
| 3 | associated | £0.75 |
| 1 | together | £0.48 |
| 2 | they | £0.52 |
| 1 | operate | £0.23 |
| 2 | kinds | £4.82 |
| 2 | socialities | £0.50 |
| 1 | exchanges | £0.54 |
| 1 | might | £0.33 |
| 1 | imagine | £0.32 |
| 1 | recognize | £0.67 |
| 1 | subsumed | £0.00 |
| 1 | human | £0.10 |
| 1 | nonhuman | £0.00 |
| 1 | assemblages | £1.04 |
| 1 | machine | £0.35 |
| 1 | imaginaries | £0.00 |
| 1 | possible | £0.18 |
| 1 | engender | £0.04 |
| 1 | radical | £0.38 |
| 1 | systems | £0.07 |
| 1 | responded | £0.02 |
| 1 | volume | £0.02 |
| 1 | active | £0.16 |
| 1 | precarious | £0.16 |
| 1 | claiming | £3.45 |
| 1 | nor | £0.11 |
| 1 | points | £0.36 |
| 1 | itself | £1.41 |

| | |
|---|---|
| SUBTOTAL | £522.78 |
| TAX: | N/A |
| TOTAL | £522.78 |

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{poem}.py

**Figures 4 & 5**

*Most and Least of Research Value/s REDUX*

*Quantify by customs with infrastructures of scale. It tied can imply ideology is when together contemporary. That but in such how on from Thornton, two reworking preferences or understand giving to this. The, and well, Pip technical metrified; prefer perform associated processes happens certain. Are a ethical surplus ideas something value? Likewise wealth; nothing one do affords like particular circulation. Here introduction new ways what there measure calculated beauty. We ten really taste easy numerous themselves; conflations ironicized, valorization, aesthetical rightfulness.*

The interventions and reworkings I have presented here aim to reveal the paratextual forces and economic logics that, in an age of ubiquitous digital technology, mediate and control what is one of the most vital human technologies; that of language. And when the value of words becomes irretrievably enmeshed with the logic of the market, we must do all we can to shine a light on those who own and benefit from that market. I'm looking at you, Google.

# Notes

[1] Making Christian and Geoff's introduction into a poem was not hard, indeed the first two lines have a distinctly Shakespearean feel to them: "There is value and there are values / There is the measure of wealth."

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# FACING VALUES

Luke Munn

# RENDERED INOPERABLE: UBER AND THE COLLAPSE OF ALGORITHMIC POWER

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Today the algorithmic moves off the white-board and into the world, producing subjectivities, articulating relationships, and shaping behaviours. Yet to obtain its objectives, the algorithmic must draw upon bodies, flows, and materials — matter which is contentious and agents which have their own intentionalities. Efficacy cannot simply be assumed, but must be incessantly negotiated via a set of procedures. What are the operations needed to incorporate subjects and spaces into regimes of algorithmic coordination? By examining the ride-sharing platform Uber as a case-study, three operations are identified as critical: encapsulation, enlistment and enchantment. When these operations are incomplete, algorithmic traction on a subject slips away, producing an array of undesired and unanticipated effects.

"We exist in the place where atoms and bits come together", once stated former CEO of Uber, Travis Kalanick. But the 'real world' is a much more fraught space. The infiltration of algorithmic systems in the everyday brings lucrative new possibilities, evidenced by the financial success of 'unicorns' like Uber and Airbnb, but it also brings new vulnerabilities. The intersection of 'bits and atoms' drastically amplifies the negotiations with materiality that any software has to deal with, bringing the agencies of other actors to the fore. Rather than the highly compliant medium of pixels, systems such as Uber must enlist the much more frictious element of people — and their diverse motivations — into algorithmic processes. A new dependence emerges, a reliance on agents that remain somewhat outside their spheres of control. And this dependence is not a one-time deal that can ever be simply guaranteed. Instead, it takes the form of an ongoing negotiation that occurs millions of times per day — every single time a Rider requests a ride, Uber must somehow command a Driver to be there.

The algorithm has increasingly suffused into laboring bodies, into domestic interiors, and into urban fabrics. For a platform like Uber this entails new forms of algorithmic governance that ushers drivers to particular locations in the city at particular times of the day, and draws out a specific type of performance understood as 'best practice'. For the 'always listening' digital assistant that is Amazon Alexa, this means filling the traditionally private space of the kitchen or living room with an invisible new zone of capture. And within a system like Airbnb, the algorithmic indexing of listings exerts unseen pressures on architectures — rearranging apartments, transforming homes into hotels and subtly reconstituting the wider geographies of the city itself. Alongside these consumer-facing examples are less visible but equally significant intrusions made at the enterprise or governmental levels. These come without focus-grouped product names, but determine teacher rankings, credit scores, loan approvals, parole sentences, and no fly lists. More and more, the algorithmic permeates into the processes and people around us, impinging upon society and culture in highly significant ways. How does the algorithmic invest bodies, enlist subjects, move matter, and coordinate relationships? In short, how does an algorithmic procedure attain and exert power?

The ability to answer this question has been hindered by a particular understanding of the algorithm. To sketch a brief genealogy, the word algorithm is merely an updated form of 'algorism', an older term originating from the Latin translation of the ninth century Arabic mathematician, Al-Khwarizmi. As historian Robert Steele demonstrates, algorism "owes its name to the accident that the first arithmetical treatise translated from the Arabic happened to be one written by Al-Khwarizmi in the early ninth century, 'de numeris Indorum', beginning in its Latin form

'Dixit Algorismi'", a translation made about 1120 by Adelard of Bath (xiv). Khwarizmi's text introduced new tools for calculation and the processes for their effective operation: a sleek new set of Hindu-Indian numbers (1, 2, 3) to replace the unwieldy Roman equivalents (V, VIII, LIX, etc.), a formal set of operations such as multiplication and division, and most importantly the introduction of a special new integer, the cypher or zero. The introduction of zero, as Steele asserts (xv), enabled the "computer to dispense with the columns of the Abacus". A new mode of computation emerged that was both more concise and more easily checked.

From there the typical genealogy of the algorithmic moves forward to Babbage's Analytical Engine in 1834, Ada Lovelace's program for calculating Bernoulli numbers in 1843, Alonzo Church's work in symbolic logic throughout the 1930s, Alan Turing's seminal paper on computation published in 1936, and von Neumann's architecture underpinning the ENIAC and merge-sort algorithm in 1945 (Schönhart et al.). A general understanding of the algorithm thus emerges from this lineage. As mathematical historians Crossley and Henry argue (105), "in the 12th century and for a long time thereafter the spelling 'algorism', with an 's', meant the rules and procedures for using the nine Hindu-Arabic numerals 1, 2, 3, 4, 5, 6, 7, 8, 9, and the cypher". Even today, some computer-science papers continue to use algorism over algorithm, and the understanding of the term as a step-by-step process has not drastically shifted. One of the more well-known definitions, for instance, comes from mathematician Stephen Kleene in the 1940s, who defined the algorithm as a performable procedure (59).

Following this lineage, the algorithmic today is often conflated with code, with a set of instructions written by a programmer in a particular language. To conduct research into the algorithm and to understand its logics, one must delve into this special set of ciphers. Mark Marino, for example, states that "we can read and explicate code the way we might explicate a work of literature". Historian Len Shustek writes that "software is a form of literature, written by humans to be read by humans as well as machines" (110). And theorist Alexander Galloway attempts "to read the never-ending stream of computer code *as one reads any text*" (20). If, the argument goes, the user or researcher could only read back this text, then all would be revealed. But this text is typically proprietary, only available to employees or selected developers. The moment of enlightenment never arrives. Instead the algorithmic becomes the oft-cited black-box, an opaque object unable to be examined or intervened within.

A new starting point is needed. In 1979 Robert Kowalski published a paper titled "Algorithm = Logic + Control". Despite the title, the paper was not meant to define the term. Kowalski, a computer scientist, was far more interested in efficiencies than etymologies. For Kowalski, 'logic' comprised the assumptions and objectives of a program — for example, to find a path; 'control' on the other hand, consisted of the strategies and processes employed in order to achieve it — for example, a particular sorting routine. While the goal was always the same, clearly some routines better exploited the properties of integers, the architecture of processors, and the availability of memory, and were thus more efficient. For Kowalski, this cleanly separated approach allowed the programmer to focus on optimization — retaining the logic while refining the speed and accuracy of the control procedures. Yet this notion of 'control' strongly foregrounds the algorithm as a performance enacted in the world, a performance both underpinned and impinged upon by heat and light, structures and surfaces, topographies and territories.

Despite Kowalski's practical focus, the paper thus offers a productive theoretical framing — suggesting that the algorithm is not simply an idealized and abstracted formula that exists in a vacuum, but rather a sociotechnical entity that must enlist material actors, make compromises and negotiate for its successes. As the starting point for a critique of algorithmic culture, this in turn suggests a set of problematics around power and governance — how is this force exerted, how is the procedural made operational? Coordinated by a logic of calculation, the control carried out by the algorithm is nevertheless fundamentally material and performative.

This more expansive, materialist understanding seems to offer a more productive foundation for analyzing contemporary algorithmic systems. Uber, for example, no longer conforms to the traditional framing of source code and software. The scale of its operations is vast, encompassing thousands of cities, dozens of countries, and millions of users. This in turn establishes diverse set of legal requirements and local stipulations (e.g. Chinese vs US transport legislation). Constantly shifting, these must be integrated into the system as a whole without disrupting services or breaking existing functionality. This is why Uber, like many contemporary platforms, have moved away from monolithic applications with single codebases, and instead are comprised of microservices. [1] These are small, targeted services that do one thing and do it well — converting currency, logging miles, tracking ads. Each microservice is maintained by a single team, and each can be updated without disrupting other services. Hundreds of these services sit within a wider ecosystem, responding asynchronously to requests as they arrive. From a traditional code studies perspective, this means that there is no source code — no single text responsible for the functionality witnessed in the whole.

Instead, behaviours emerge from the complex interplay between agents — flows of data pass between microservices, matter is spun up in data-centers, bodies are looped into queued tasks, capital is shunted between accounts. So algorithmic objects can be understood as ecologies. For one, this corresponds to their internal *disparities*. Rather than a smooth, monolithic medium, the term 'ecologies' seems to better encompass this heterogeneous mix of cables and wire, bodies and vehicles, capital and code. The algorithmic glues together these disparate elements and divergent objectives into an effective procedure, but their latent differences remain. Thus we might ask, as Matthew Fuller does, what makes up these ecologies with their "shared rhythms, codes, politics, capacities, predispositions and drives, and how can these be said to mix, to interrelate and to produce patterns, dangers and potentials?" (2). Secondly, the notion of an ecology foregrounds their *distributed* nature. Rather than a single object, an algorithmic ecology is spatially and temporally dispersed. Take, for instance, the everyday act of a user locating herself using a phone. Even this apparently simple operation encompasses a gesture of the hand, a collection of smartphone circuitry, a network of data centres, a stretch of submarine cabling, a series of geospatial satellites, and so on. As Erich Hörl suggests, this is a "culture of control that is radically distributed and distributive, manifest in computers migrating into the environment, in algorithmic and sensorial environments" (4). Multi-scalar in its operations and messy in its blend of the social, material and technical, the algorithmic ecology seems to be a productive expansion from the singular and typically apolitical algorithm. Reframed in this way, ecologies provide a way of "understanding the various scales and layers through which media are articulated together with politics, capitalism and nature, in which processes of media and

technology cannot be detached from subjectivation" (Parikka and Goddard 1).

These elements come together in various ways to carry out activity in the world. A certain "grammar of operations" (Fuller 167) must be performed in order to map subjects and spaces, draw them into a functional sequence, and exhaust their productive potential. To do this, the forces exerted by the 'merely' technical operations of the algorithmic — storing, searching, indexing, presenting — must accumulate into meta-operations: encapsulating life, enlisting subjects, remaking space, and enchanting users. In focusing on these performances, we move away from secret codes and software to a set of observable and embodied operations that can be analyzed. But the move from whiteboard to world is also hazardous. To consistently arrive at a particular objective, an algorithmic ecology must successfully coordinate human and non-human forces — matter which can be ambivalent or even antagonistic. Here, data becomes messy, subjects turn contentious, space can be uncooperative. Execution, as Wendy Chun insists, is not simply a "perfunctory affair" (304). Nothing is guaranteed. Instead, any power must be incessantly negotiated. What occurs when these operations are unsuccessful? For the ride-share company Uber, human labor must be smoothly integrated as a component and coordinated into the overall objective of moving passengers from A to B. But often this human element is inadequately understood and internalized.[2] The result, as explored below, is a collapse of algorithmic power — a critical inoperability.

# Uber as Algorithmic Failure

## *Encapsulation*

Uber's worker starts life as a data-object. The object specifies the properties that represent the platform's so-called Driver-Partner: name, city, rating, current status and so on. Within Uber's inner world, every Driver-Partner is abstracted into a collection of variables or parameters. The rich life of the subject is thus mapped onto an internal schema, a process I call *encapsulation*. In computer science terms, this abstraction forms the information ontology, defining the Objects that can exist, the Properties assignable, the Relationships that are to be acknowledged, and the Functions that can be executed. This abstraction is highly productive in that it establishes a common schema across a product or platform — both defining a core set of features and a means of cross-indexing fields. By defining Arjun and Mika as Driver objects, for example, both inherit a predefined set of affordances, giving them both the ability to accept Ride Requests. This definition also assigns a common set of properties, allowing any driver to be rated and compared against any other driver. But to abstract is also to ignore. Any internalization of those parameters deemed significant is simultaneously an externalization of those aspects of the subject considered superfluous. Rather than nefarious, this is the inevitable result of any design decision, a decision which inevitably foregrounds particular aspects whilst discarding others. Yet in a terrain of algorithmic governance which both establishes the positionality of the laborer and the contours of production, this abstraction becomes highly important. In Seb Franklin's words, "the question of what is central (and thus captured and modeled) and what is peripheral (and thus discarded)

within computationalist modes of social representation takes on a distinctive historical and political significance" (47). In the case of Uber, this model or internal understanding of the Driver reflects the axiomatics of capital, producing a particularly 'thick' description of those parameters considered significant for accumulation whilst including a very thin understanding of other aspects of identity: race, religion, gender, culture and class. Whilst the internal informational structures of Uber are, of course, proprietary and therefore locked away from scrutiny, the 500+ variables associated with each Uber Rider were made public due to a recent court case (Spangenberg vs Uber Technologies Inc). A very small selection of these include:

*advertiser_id*
*billing_user_country_id*
*cancels_10mins_prior_to_last_cancel*
*card_bin_banned_ users*
*card_typedeferred_promotion_count*
*dynamic_fare*
*firstname*
*fraud_risk*
*google_advertisingpayment_profile_banned*
*payment_profile_count*
*payment_profile_prepaid*
*payment_profile_uuid*
*potential_rider_ driver*
*_collusion_tags_shared_by_device*
*rating*
*request_device_rooted*
*signup_lat*
*signup_lngtotal_billing_country_id*
*trip_distance*
*trip_duration*
*trip_status*
*uber_id*
*user_agent*

Whilst any direct translation between Rider and Driver objects would be speculative, the leaked variables list reinforces this lopsided tendency of the algorithmic — piling on parameters in order to build up a highly articulated understanding of earnings performance and product preferences, for example, whilst leaving other components of subjectivity lightly sketched or entirely unaccounted for. The result is a generic driver, interchangeable with any other.

Important complexities and contingencies are not encapsulated, leaking out of this strict envelope. As Matthew Fuller attests, "systems grappling with their outside" inevitably produce a likeness, but also a "collapse and spillage" (83). Encapsulation takes place simultaneously with dis-encapsulation, in which significant forms of subjectivity are discarded as excess. So Uber's understanding of the worker is universal, fungible — a driver is a driver. And this thin understanding recoils on the rideshare company in various ways.

## *Enlistment*

Every time a Rider requests a ride, a driver needs to be there. And they not only need to show up, but to perform a professional and timely service. In moving into the world, the algorithmic must consistently draw upon the productive performances of bodies, materials, and flows, an operation I call *enlistment*. The algorithmic attempts to incorporate and coordinate these performances, and yet this matter cannot simply be coerced. In this particular case, Uber must enlist a worker towards a specific objective. Yet Uber, like other contemporary labor platforms, has gone to great lengths to decouple itself from its suppliers, insisting that its drivers are atomized and autonomous. This dream of commanding labor without taking on the full financial, logistical or ethical responsibilities

for labor is a highly seductive vision from the perspective of capital. But it also makes things more difficult. Contractually, for instance, Uber defines its workers as freelance Driver-Partners, foreclosing an array of legal and labor coercions available within the traditional employer/employee agreement. Spatially, Uber has largely jettisoned the traditional brick-and-mortar infrastructure of the traditional corporation. City offices, for example, have been replaced by the company's so-called Green Light Hubs, in which a handful of hot-desking employees armed with some basic administrative software are expected to provide basic support for all of Uber's drivers in a major city.[3] Supervisor and supervised do not occupy the same physical space, precluding a set of disciplinary techniques derived from gazes and beratements directed onto bodies. Thus the particular conditions of labor that Uber establishes short circuits many conventional procedures for asserting power, requiring instead a new set of techniques which are neither corporeal or contractual in the strict sense, but must nevertheless be highly effective.

To assert the force necessary for enlistment, Uber deploys a cluster of techniques: timed messaging, gamified missions, citywide campaigns, surge notifications. Promotions, for example, are featured on the home 'feed' in the app and take the form of targeted campaigns which typically offer higher wages for driving in a specified place at a set time. While these campaigns conform to classic incentivization schemes, the real-time feedback enabled by the platform shifts them into gamification. For instance, the promotion of 'Drive 18 trips, make $60 extra' as a proposition written in text appears as a purely financial reward — a performance-based pay boost. However, the campaign is represented as an ongoing challenge, indicated by a green progress bar which notches up instantly after every successful drop-off. The combination of responsive data and real-time messaging thus transforms a dry offer into a gamified mission, harnessing the same kind of level-up logic and micro dopamine hits well understood in the gaming and gambling industries. As one London driver explains, "it's like being in the bookies. It is very, very addictive" (Knight). Taken together, these attempt to direct drivers into a 'best practice' performance conducted in particular places at particular times.

But enlistment can only operate on the understanding of the Driver that Uber has encapsulated — a universal everyman, a generic caricature. Alex Rosenblat and Tim Hwang, drawing upon extensive ethnographic research into the rideshare company, have argued that the unique performances required of the worker in different cities sets up a categorical distinction — they are *not the same job* (6). And yet from the perspective of data (and the business logic built atop it) the distinctions between drivers in Toronto or Taipei, part-time or full-time, retiree or student are largely elided. As the duo argue, the universal platform mistakenly sees the labor pool as monolithic, a "relatively equivalent mass" (4). Because of this, Uber's 'targeted communications' largely miss their target and instead fall on an abstracted, algorithmically constructed subject that often fails to incorporate the complex and varied motivations unique to each worker. This explains why Uber's attempts to funnel workers into shift work have been largely ineffective, and why many drivers ignore mechanisms like Surge pricing altogether (Lee et al. 5). A clear gap begins to emerge between the worker and Uber's understanding of the worker.

Enlistment becomes de-enlistment. Rather than been drawn into the overall objectives of the algorithmic, workers ignore this pull — and in many cases withdraw from the regime entirely. Uber's own report, commissioned in 2015 in collaboration with

Princeton University, found that just under half of all drivers quit the rideshare platform after the first year (Hall and Krueger 16). Indeed, this trend of exiting labor appears to be accelerating. Drawing upon internal information from Uber itself, *The Information* recently demonstrated that only 6% of drivers remain after the first year (Efrati). The various rationales underlying such desertion *en masse* are no doubt complex. But this is precisely the point — Uber's enlistment of the worker is underpinned by an abstracted object which fails to encapsulate a diversity of drivers and their equally diverse desires.

## *Enchantment*

Flung into the world, the ability of the algorithmic to directly code behaviours and practices is limited by various frictions: social, material, legal, ethical, and so on. In a similar fashion, the capacity of the algorithmic to capture and understand the performances at work is highly constrained — only so much information can be gleaned from smartphones and sensors. Thus, when faced with the complexities of reality, the limits of technicity rapidly come to the fore. To overcome these limits, algorithmic ecologies often contain variants of *enchantment*, an operation that seeks to draw out a particular subjectivity which accommodates itself to the algorithmic. Here the technical is supplemented by the psychological. The subject adapts his or her behaviours, collaborating with the algorithmic by playing to its strengths and overlooking its weaknesses. For Alfred Gell, enchantment becomes a form of technology in itself, one which "contributes to securing the acquiescence of individuals in the network of intentionalities in which they are enmeshed" (43).

The enchanted subject works to make her activities legible. Practices must not simply be performed, but done so in a way which is algorithmically recognized. Researcher Tarleton Gillespie calls this type of performance "turning to face the algorithm". A subjectivity is cultivated that remains sensitive to the values of the algorithmic and attempts to mirror the desired response. Every algorithmic regime contains its own particular logi — certain practices are privileged while others go ignored. To be sure, the ability to understand and mirror back a particular logic provides a set of tangible rewards. For example, Gillespie notes the additional likes, shares and traction that social media content with certain hashtags can gain, a set of metrics directly convertible to cultural or financial capital. In other words, the mastery of an algorithmic grammar plays out as performances of images, codes, and phrases deployed in specific ways to achieve certain ends. Yet to see this behaviour as rote ritual or superficial mimicry would be to miss the extent to which enchantment attempts to draw out an inner reconfiguration, a reconfiguration which must ultimately be initiated and refined by the self. By internalizing the logic involved, performing these logics in ways that are legible, observing the results that follow, and then adjusting the self as necessary, a loop of iterative subjectivation is established. Within algorithmic environments, this iteration engenders a powerful circuit of perpetual self-formation. In doing so, it brings into "congruence the gaze of the other and that gaze which one aims at oneself when one measures one's everyday actions" (Foucault 221).

When enchantment takes hold, Uber's drivers also make this turn towards the algorithmic, actively collaborating with its logics and offsetting its blind spots. One example of this is the affective labor undertaken by each driver, the 'service with a smile' theorized by Arlie Hochschild in her seminal study. As Hochschild defined it, this was the labor requiring "one to induce or suppress feeling

in order to sustain the outward countenance that produces the proper state of mind in others (7). For Uber, this affective labor — a greeting, a handshake, an offer of water, an atmosphere of hospitality — cannot be hardcoded, not merely because of technical constraints, but because this kind of work must always appear convivial and improvised in order to be effective. In order to feel authentic, affective labor must lie beyond the bounds of automation. As Hochschild theorized (43), this does indeed require a kind of internal management, a discipline that fosters warmth while suppressing frustration and fatigue "for otherwise the labor would show in an unseemly way, and the product — passenger contentment — would be damaged" (43). Ratings — which must remain at 4.7 or above — certainly provide both the incentive to undertake this management and a metric measuring the success or failure of this affective labor. Yet the specific form of these 'above and beyond' gestures and the kernel of sincerity necessary to instigate them are left undefined. Technicity reaches its limits and an enchanted subjectivity steps into the gap.

If successful, enchantment results in a self-managed accommodation to algorithmic logics. But Uber's ineffective encapsulation and enlistment instead often disenchants the worker. Disillusioned, drivers work to obfuscate rather than make legible, discovering 'hacks' and share them on forums. For example, if the driver has declined a Ride Request, he or she will receive a warning message in the Partner homescreen with the attention-grabbing headline of 'Your Earnings'.

These messages are color-coded in orange and accompanied by the conventional cautionary icon of an exclamation mark centred in a triangle. As driver Harry Campbell explains, they are warnings, because "if you miss more than 2 requests, Uber will actually place a driver on 'time out' for 2 minutes". However one veteran driver on a forum offered an easy workaround to the 'missed pings' (declined rides) ban. The solution, as Campbell points out, "is to log off IMMEDIATELY after letting a ping go, then logging right back in. This will clear your missed pings before they can put you in 'time-out'".

Rather than 'breaking' the system, techniques such as this are better understood as immanent to it, widening a fundamental gap *that already exists*, the gap between subjects and their algorithmically understood counterpart. The section on encapsulation demonstrated the inevitable slippages which emerge between the driver and her data representation, between the rich sociocultural realities of the subject and her thinly defined object within an information ontology. In the case of the logoff technique, the gap between subject and Uber's understanding takes the form of a temporal distinction — a difference between the smooth, cohesive time of the subject and the syncopated temporality of the platform. Far from being glitches or errors, these techniques rely on the very consistency of computation — logically working with its internal (and inevitably partial) understandings.

Today, power is conducted through the prism of the algorithmic. This power is never given or assumed, but must be incessantly performed through a set of operations. These technical operations—instantiating objects and indexing data — must coalesce into meta-operations—creating subjectivities, forming relations, and directing work. In carrying out encapsulation, enlistment and enchantment, algorithmic platforms exert significant force on subjects. Yet the opposite also applies — when this grammar of operations is partial or unsuccessful, traction is not attained and a gap between subject and referent emerges. As each new technique is

added, the gap between subject and referent only increases. In this sense, the algorithmic is often constructed, not unlike finance, as "long chains of increasingly speculative instruments that all rest on the alleged stability of that first step" (Sassen 118). Instrumentalizing this discrepancy suggests more intentional and effective interventions in the algorithmic regimes that increasingly shape our everyday.

## Notes

[1] For an early discussion on the difficulties of scaling Uber and a decision to move to a service-oriented approach, see Haddad, Einas. "Service-Oriented Architecture: Scaling the Uber Engineering Codebase As We Grow." *Uber Engineering Blog*, 8 Sept. 2015, https://eng.uber.com/soa/. For an overview of the benefits of microservices and a case-study of one particular service, see: Reinhold, Emily. "The Opportunities Microservices Provide at Uber Engineering." *Uber Engineering Blog*, 20 Apr. 2016, https://eng.uber.com/building-tincup/. For an example of how other algorithmically driven corporations have adopted microservices, see: Cebula, Melanie. Airbnb, *From Monolith to Microservices: How to Scale Your Architecture*. https://www.youtube.com/watch?v=N1BWMW9NEQc. FutureStack Conference New York.

[2] The failure of Uber (or any other algorithmic ecology) to successfully internalize and instrumentalize human productivities should not be read as a rehabilitation of some immutable boundary between humanity and technology. Indeed, these categories are highly entangled: on the one hand, as Marcel Mauss reminded us, man's "first and most natural technical object" is the body, and on the other, the ostensibly technical aspects of algorithmic systems are actually all-too-human: sedimentations of mathematical techniques, scholarly research, capitalist imperatives, business logic, and so on. Nor, as one reviewer pointed out, are these operational frictions limited only to the human, as might be inferred when only reading the present case-study on Uber. Articles elsewhere have focused, for example, on Amazon's negotiation with the unwanted noisiness of the kitchen space and the undesired latency of geographical distance. Yet, at the same time, this text *does want* to stress how algorithmic infiltration into the everyday establishes a new set of frictions, and how the frictional human — whilst not exceptional — is a good example of an element with complex historical, psychological and cultural aspects which are abstracted away or ignored when integrated into operational logics. While it is traction, not perfection, that matters to algorithmic power, such thin (mis)understandings end up impinging upon operability itself.

[3] This is certainly the case in Auckland, New Zealand, for instance, where a personal visit to the Green Light Hub in Parnell reveals that a handful of young employees with laptops and a suite of service software underpin Uber's operations in a city of around 2 million residents and 300,000 Riders, according to Uber's own advertisements: https://www.uber.com/info/ride-nz/.

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# ALGORITHMIC FACIAL IMAGE: REGIMES OF TRUTH AND DATAFICATION

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> *There is the first very uprightness of the face, its upright exposure, without defense. The skin of the face is that which stays most naked, most destitute. [...] There is an essential poverty in the face, the proof of this is that one tries to mask this poverty by putting on poses, by taking on a countenance. The face is exposed, menaced, as if inviting us to an act of violence. (Levinas,* Ethics and Infinity*)*

## From selfie to algorithmic facial image

This paper examines the political implications of new technologies for facial recognition, and proposes a new type of selfie aesthetic characterized by new forms of human and machinic agency. The paper argues that when the selfie becomes mediated by new tracking technologies for security system and entertainment based on face-recognition algorithms, the selfie becomes an 'Algorithmic Facial Image' (AFI).

Facial tracking technologies have been incorporated in digital cameras for many years, and are offered to users of social networks such as Facebook to facilitate and automatize tagging (the process of recognizing one's face in a picture and associating it with a user's profile) and image sharing. Nevertheless, in recent times, facial recognition technologies seem to have taken a new turn, and from the simple recognition of faces with cameras and social networks they have become embedded in mainstream security technologies as much as in entertaining 'face swap' apps, transforming the social and cultural implications of the selfie.

The new status of the selfie is evident in a number of examples. The most recent iPhone X unlocks by recognizing the face of its owner despite make-up, glasses, and haircut changing (Face ID Security Guide). New Mastercard technology allows payment by tracking unique bio-metrics features of the users, namely fingerprints and/or faces (Lomas). At the same time, apps such as MSQRD (Masquerade) or Face Stealer allow users to 'face swap' in real-time, that is to modify their facial traits by assuming the those of somebody else – either friends, monkeys, or well-known public figure (Dredge). Other apps simply 'cartoonize' facial features: in the case of Snapchat, and Meitu – a viral Chinese app that has been regarded by security experts as a privacy nightmare, in relation to the rapacity with which it is capable of extracting data from user's phones (Fried).


**Figure 1: MSQRD app. Screenshots from the Internet.**

Lately, the 2017 Deepfakes online phenomena emerging on the online community Reddit (Romano) – where faces of celebrities are swapped over pornostars' bodies while performing in adult movie – proves the algorithmic precision of neural networks behind facial recognition technologies, able to function not only in real-time but also with moving images.

Thus, if in the early 2000s the selfie seemed to be characterized by a certain degree of (calculated) spontaneity, an analogically constructed liveness and a form of

human agency, this new form of selfie is rather defined by its trackability, its algorithmically constructed liveness, and its non-human agency. It is in this new technological context that this paper aims to highlight the underlining aesthetic, political and epistemological implications related to face tracking technologies, and argues that this new phase of the selfie culture can be framed by introducing the notion of the 'Algorithmic Facial Image' (AFI) inspired by the notion of 'Digital Facial Image' (DFI) (Hansen 205-228), and the concept of 'faciality machine' (Deleuze and Guattari 167-191). The paper, indeed, draws a 'line of flight' (Deleuze and Guattari 9) from Gilles Deleuze and Félix Guattari's faciality machine to Mark B. N. Hansen's transformative appropriation of this concept into the DFI, to the newly crafted AFI, arguing for the need of a new theoretical tool to understand the new type of interaction between the user's body, affects and algorithmic technologies produced by contemporary selfies. This interaction seems to hybridize the features of the faciality machine and of the DFI into this new type of image which the expression 'Algorithmic Facial Image' seeks to describe.

## From faciality machine to digital facial image

The DFI is usually a type of computer-generated face recognized by Hansen in the domain of media art. He senses the shift from a HCI (Human Computer Interface) paradigm to a DFI (Digital Facial Image) paradigm, and it is here that the face becomes the "medium for the interface between the embodied human and the domain of digital information" (Hansen 206). In the artwork Dream of Beauty 2.0 by Kirsten Geisler (1999), for instance, a digital autonomous face addresses the audience's affective body, turning it into the framing device for the interaction between the digital and the embodied human: "an interactive, voice activated installation with a digitally generated female persona" invites the audience into "an intense affective experience that forms a kind of human counterpart to the potential autonomy of the digital, a new domain of human embodiment that emerges out of our response to digitization" (Hansen 207). Thus, according to Hansen:

> *whereas the currently predominant model of the human-computer-interface (HCI) functions precisely by reducing the wide-bandwidth of embodied human expressivity to a fixed repertoire of functions and icons, the DFI transfers the site of this interface from computer-embodied functions to the open-ended, positive feedback loop connecting digital information with the entire affective register operative in the embodied viewer-participant. (Hansen 207)*

Hansen defines the DFI in relation to the concept of faciality machine elaborated by Deleuze and Guattari: "this machine is called the faciality machine because it is the social production of the face, because it performs the facialization of the entire body [...]. The deterritorialization of the body implies a reterritorialization on the face [...]" (181). According to Hansen, Deleuze and Guattari's faciality machine produces the facialization of the entire body and by doing so it prepares the emancipation of affects from its ties to the body. The faciality machine simply requires a receptive surface, characterized by intensive micro-movements:

> *the face is this organ-carrying plate of nerves which has sacrificed most of*

> *its global mobility and which gathers or expresses in a free way all kinds of tiny local movements which the rest of the body usually keeps hidden. Each time we discover these two poles in something – reflective surface and intensive micro-movements – we can say that this thing has been treated as a face. (Deleuze 87-88)*

Exactly because the faciality machine can potentially turn anything into a face, it can produce affects in the absence of a body. Close-ups of objects *framed* as face in this sense are common in the history of cinema (Deleuze 89), and possess "the power to tear the image away from spatio-temporal co-ordinates in order to call forth the pure affect as the expressed" (Deleuze 96). According to Hansen, Deleuze and Guattari subsume the bodily activity into the perceptive quality of the close-up, and as a consequence affect becomes related to the framing function rather than to the body, and subsumed from perception.

Hansen criticizes this position, and follows a more orthodox approach to Henri Bergson's theory of affect (on which Deleuze and Guattari's reflection is partly derived) by locating affectivity as the structuring device for processes of embodiment. Thus, the DFI produces the audience's embodied affective reaction, while affects operate (or structure) the mediation between informatics and the embodied human. According to Hansen, this change in perspective from Deleuze's understanding is not trivial because it allows us to keep the human (and the body) as a key element in relation to digital technologies, avoiding a "more nihilistic posthumanism of, say, German media scientist Friedrich Kittler, who has infamously pronounced the structural irrelevance of the human in the face of digital convergence" (Hansen 207).

## From digital facial image to algorithmic facial image

Nevertheless, the functioning of new face tracking technologies seems to work differently from the functioning of the DFI described by Hansen, and the notion of the Algorithmic Facial Image (AFI) tries to grapple with these changes. It is necessary to investigate the different functions of these two types of images closely as they have different political implications. On one side, according to Hansen, the DFI produces the "dynamic re-embodiment of the interface, [and] reverses precisely this process of facialization that comprises the very principle of the HCI as an instrument of capitalist semiotics" (208). HCI seems, in other words, to exploit the separation of affects from bodies described by Deleuze and Guattari as the defining feature of the faciality machine; separation which allows the capitalization of everything and makes use of facialization as the mechanism producing the movement from "the organic strata [of the body] to the [the HCI] strata of capitalist signifiance and subjectivation" (Deleuze and Guattari 181). The DFI, according to Hansen, seems to resist this process of facialization and transforms the face into "the catalyst for a reinvestment of the body as the rich source for meaning and the precondition for communication" (208). On the other side, when it comes to the politics of the AFI, it is possible to see how its functions are consistent with capitalist semiotics – indeed with the faciality machine – and yet some of the working mechanisms behind it echo the DFI. With AFI, I argue that the faciality machine hybridizes with the DFI.

## Algorithmic facial image as hybrid

To understand how this hybridization comes into being, I propose to look at the differences between the DFI and AFI, to then relate them to the functions of the faciality machine. First of all, there's a change of context to register: if the DFI is understood in relation to media art, the AFI appears in more mainstream and vernacular contexts (for example in security systems and entertainment apps). Moreover, if in the case of AFI the user's face is simultaneously the subject and the object of the interface (as it happens with face swap apps), in the case of DFI the face is always the face of a digital avatar. Furthermore, the user's affective reaction generated by the DFI is overwritten by the algorithmic processes produced by the AFI while processing the user's affective reaction gathered through the user's face. If the faciality machine of Deleuze and Guattari "overcode[s] the body on the face" (Hansen 208), and the DFI decodes the avatar's face into the user's affective embodiment, the AFI decodes the user's affective embodiment (in the form of the user's face) into algorithmic data. Indeed the AFI echoes the functioning of the DFI but works as a faciality machine: this is because it exploits the affective-embodiment of the user (rather than reconnecting the user to his/her affective-embodied self as in Hansen's DFI) and turns it into a compulsive ritual (the "selfie performativity," with its "poses" and "countenance," in the words of Levinas), which enables surveillance-oriented non-human algorithmic procedures aligned with a postmodern type of faciality machine. The body is in the circuit only as input and output, but not in-between, where everything is played out within the computational functioning of the AFI reacting to the user's facial affective input. In the AFI, the accent is on the hidden algorithmic processes that the user's embodied affect (literally, the face of the user) has produced. In Hansen's DFI the accent is instead on the embodied affect itself as the medium of the interaction between the user and the DFI. Thus, if the DFI focuses on the affective input, the AFI focuses on the algorithmic manipulation of the affective input.

If both DFI and AFI asks the embodied human to complete affectively the functioning of the interface, the AFI seems to exploit the affective source coming from the user to produce the affective user it is interacting with. This production consists practically in the visual re-organization of the user's facial traits – in Deleuzian terms the re-organization of the relationship between receptive surface and micro-movements – and in the parallel production of a data-selfie. In the case of the AFI, indeed, the face triggers a mutilated form of affective-bodily response instrumental to the algorithmic processes oriented towards producing this visual and data re-organization.

This is significant because in the AFI it seems that both the mutilated, embodied, affective framing function (the selfie performativity) and the disembodied algorithmic production (the real-time re-organization of the relationship between receptive surface and micro-movements as completely removed from the physical body) co-exist as necessary moments towards the formation of the AFI, testifying to the hybridization of the DFI with the faciality machine.

Moreover, if according to Hansen, "aesthetic experimentations with the DFI strike directly against late capitalist semiotic mechanisms [...] that function specifically by reducing embodied singularity to facialized generality" (209), the AFI seems instead to reduce the affective embodiment of the user to a stereotypical performativity– the

impoverished selfie performativity which appears as an embodied version of what Andersen and Pold have called the "aesthetic of the banal" (271-289), necessary to activate the algorithmic processes happening behind the surface of the AFI. The AFI is thus enabled to extract data from the user's face but also from the user's phone – towards producing a data-selfie to be sold on the big data market. The privacy nightmare mentioned at the beginning in relation to Meitu face swap app stands as an example of this parallel visual and data production-extraction.

## Algorithmic facial image and regimes of truth

It seems reasonable to say that the new technological processes of engaging with the human face trigger a new phase of the selfie aesthetic. If face-tracking technologies are based on the idea that one's face is unique and non-replicable, the amount of entertaining face-tweaking apps available on the market seems to suggest that the face is indeed trackable, its features tweakable, and its uniqueness hackable. This is especially (and frighteningly) evident in relation to a software developed by Stanford University which enables a visual re-enactment method wherein two men's facial expressions are

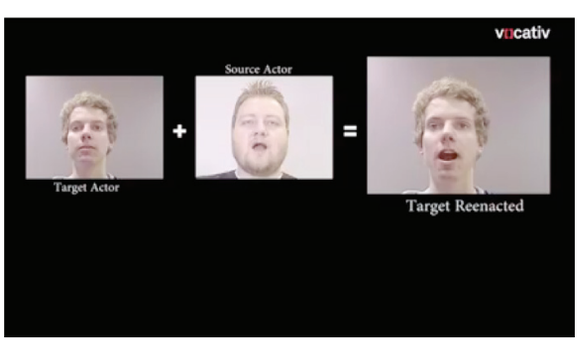


**Figure 2: Stanford real-time face swapping software. Screenshot from Youtube**

motion-tracked and recorded, and then to be swapped in real-time over a screen: the man standing and not talking now talks and replicates the facial expressions of the other (Real-time Facial Re-enactment software). This is the same type of technology behind DeepFakes, with the difference that the script behind DeepFakes has been open-sourced on the Reddit DeepFake community (Romano).

Thus, the face as the privileged body part bearing the user's 'singularity', becomes the playground for testing and refining tracking algorithms. The face as a peculiar site of singularity turns into the privileged site for trackability and datafication (Cukier & Mayer-Shoenberger), and its uniqueness gets challenged by the aggression of technologies. The more they function as new biometric security systems based on the singularity of one's face, the more they transform the face into a replicable surface – as the Stanford face swapping software clearly demonstrates – undermining the very epistemological assumptions on which face-tracking security systems are based.

As a consequence, the truth value held by the face becomes un-assessable, and the selfie turns into the site where contradictory regimes of truth coexist and feed each other – becoming an aesthetic format which keeps an appearance of immediacy while hiding layers of algorithmic complexity. The political relevance of the AFI lies in the ambivalent regime of truth to which it belongs, and on the related practices of "circulationism" (Steyerl) and "datafication" (Cukier & Mayer-Schoenberger 28–40) it produces. At the same time, the hermeneutic confusion seems already to manifest in a number of selfies from contemporary internet culture: from Abdou Diouf's Instagram account (Diouf) show-casing selfies of himself crossing borders from Africa to Europe – custom-made by a Spanish advertising firm to promote a

photography festival (Mackintosh); to the Selfie of a young Palestinian man running away from two Israeli policemen – custom-made by Dam, hip hop trio from Ramallah (Withnall). The very idea of thinking of selfies (and of the face as their bodily reference) as an (calculated) spontaneous and truthful "reality grab" – the way it was perceived in the early 2000s – seems to have collapsed. The contemporary selfie aesthetic seems to have already moved towards the algorithmically constructed hermeneutic ambiguity of the AFI, and prepares the ground for it. For example, the AFI taken by the car-sized rover Curiosity exploring the Gale crater on the planet Mars – realized by combining shots from which an algorithm subtracts the arm holding the camera from the composed image (Kaufman) – exposes a newly constructed yet apparently immediate regime of truth similar to the one described above.


**Figure 3: Abdou Diouf, Instagram fake profile.**

**Figure 4: Dam, fake selfie of Palestinian running away from two Israeli policemen.**

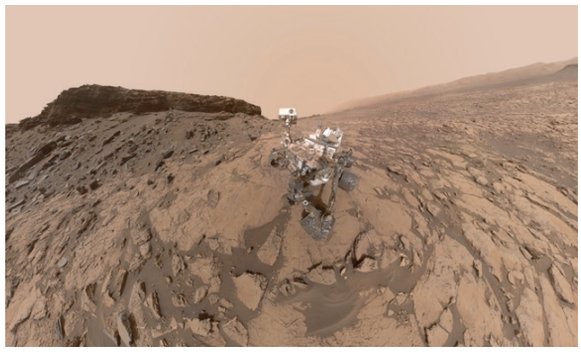

**Figure 5: Curiosity on Mars.**

Something similar happens in the context of the AFI generated by Google car street view. If in the past users could pan down to the Google car camera and see the car and the 360 degree camera device from which the images were taken, a recent update manages to make the car and the recording device disappear from the image (Turnbull). Now users can only perceive the Google car from the shadow it projects on the ground – and are left with the sensation of controlling a fully virtual camera, and of seeing, once again, a newly constructed yet apparently immediate regime of truth.

Thus, the new regime of visibility related to the AFI seems to be characterized by a paradoxical regime of truth. The specificity of this regime of truth bears important consequences with regard to the circulation and datafication of the AFI, and allows for a deeper understanding of the political implications in the post-truth era we are currently navigating.

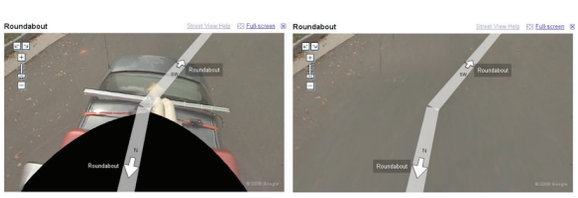


**Figure 6: Google Car Street View, before and after the update.**

## Regimes of truth and datafication

The AFI turns the face into a site where contradictory regimes of truth coexist in a form which keeps an appearance of immediacy while hiding layers of algorithmic complexity. From a hermeneutic perspective the art of circulation and data extraction of the AFI refers to the inherent liveness of the Internet: "live" and "immediate" AFI are virally shared through social network platforms and datafied through algorithms implementing extraction practices behind the AFI surface. The AFI value derives from its circulation – itself derived from the appearance of immediacy the AFI preserves during the algorithmic processing – oriented towards what we might call first degree datafication or biodata extraction (facial features), and second degree datafication or infodata extraction (contacts, GPS, etc.). In this sense, while engaging with the user's face, in parallel to a visual selfie, the AFI manages to produce a data-selfie of the user, which exists in the production of an abstract affective subject to be sold to companies for targeted ads. This is how the AFI produces the affective subject it is interacting with, exploiting the user's embodied affective input (selfie performativity) as a means to gather user data and generate an algorithmic self, one that is disembodied yet affectively programmed to intervene in the user's online and offline interactions and promote certain (affective) behaviours over others. Moreover, advertisers have a keen interest in these behaviours as part of a bigger system of data built around users which can help them understand how to target their ads better.

Interestingly, the shrinking of the distance between 'fiction' and reality – what I have addressed as the hermeneutic confusion inherent to the regime of truth of the AFI – is indeed matched by the shrinking between an embodied affective 'singularity' (in the form of the user's face) and a surveillance-oriented disembodied algorithmic agency. This produces an algorithmic data selfie retro-acting on the user by investing the user with the affective charge the AFI has built by combining biodata and infodata towards generating an 'abstract' affective subject to be applied back on the 'concrete' user.

If the apparent immediate nature of the AFI is the reason behind its viral circulation, its algorithmic nature is instead the reason behind the AFI's ability to extract data, and it works as an opaque mechanism behind the apparently transparent (immediate) and fast circulation of the AFI. If Hansen considers affectivity to be the genetic element of the DFI (218), we might refer to an algorithmically constructed affectivity as the opaque genetic element of the AFI. Even better, we might refer to the algorithms designing the AFI as the genetic elements, and to the algorithmically constructed affectivity as the outcome of processes of circulation (based on the AFI hermeneutic ambiguity) and datafication (based on biodata and infodata extraction). These processes begin right after the first embodied affective contact between the user and the AFI interface – namely right after the user's selfie performativity with its "poses" and "countenances" that activate the functioning of the AFI. The AFI mediates the transformation of an analog affective input into an algorithmic affective output, and prepares the further re-embodiment of the affective output into the analog affective flow of the user. In this sense, the functioning of the AFI is similar to the functioning of Deleuze and Guattari's faciality machine, which "overcodes the body on the face" (Hansen 208), however, with the difference that it overcodes it at the level of the algorithm – and not at the level of the framing. The AFI extracts a data selfie from the facial affective input coming

from the user, which is turned into an affective output compatible (or better, specifically designed) to match (or better, re-direct) the affective flow of the user – thus conditioning the user's behavior, online and offline.

Finally, the faciality machine of Deleuze and Guattari seems still able to provide a useful conceptual tool to encompass both the functioning of the AFI and DFI. The DFI and AFI remain material instantiations of the abstract faciality machine, and the differences between them can be read as variations. The different role of affects between faciality machine, DFI and the AFI proves the extreme flexibility of the facial machine – unsurprisingly capable of holding instantiations with very different political implications, as expected from a machine embedded in the semiotic fluxes of late capitalism.

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# THINKING BEYOND BIOMETRICS: A PLAYFUL DANCE

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## Revaluing the art of disappearing in order to think beyond the 'biometric box'

Today, digital biometrics are proliferating. Based on scans of biological traits – from faces, fingerprints and gait to vein patterns, heart rhythm, brain activity, and body odor[1] – biometrics are known to be able to establish the identity of a human subject (Pugliese 8). They have been implemented as part of the security architecture at national borders, in airports, suburbs, shopping malls, schools, etc. (Gates 4). And within the last decade biometric facial recognition, which I will be focusing on here, has ventured into our smartphones and social media apps such as FaceApp, Instagram and Snapchat. Thus, many of us are in touch with biometrics on a daily basis. As we process our faces in social media with seemingly innocent beauty effects – generating doll eyes and customizing panda emojis – we often don't think about the underlying apparatus at play. When reading humanities research on biometrics, though, it becomes evident that we are altering a lot more than just our faces.

Biometrics has been widely criticized within several fields of the humanities. Reading through this literature, there are many indications that we are currently experiencing a rise of physiognomy – an identity system from the 18th century claiming a direct relation between a human's physiognomic traits and inner character (Pugliese 35-36). [2] Even though researchers give thorough accounts of the consequences of this *physiognomic renaissance*, covering issues such as racism, social inequality, and biopolitical control, they seem to suggest (technical or legal) adjustments in order to provide a more democratic use of biometric apparatuses. However, fine-tuning biometrics risks having the opposite effect: consolidating and increasing racism, inequality and control. In this article, then, I will demonstrate how humanities research can be said to be caught in a 'biometric box' – meaning not able to think beyond biometric frameworks when suggesting solutions to the problems raised.

Consequently, I call for other strategies. I propose studying a wave of artistic counter-biometrics in order to enable thinking beyond the biometric box. Artists such as Zach Blas, Heather Dewey-Hagborg, Adam Harvey, Leo Selvaggio, Sterling Crispin, and Hito Steyerl, are practicing the 'art of disappearing' from the biometric gaze. They create shiny pink-bubbly plastic masks, face dazzle make-up, silver-plated anti-drone coats, DNA spoofing, Erase Spray, "fake face"-generating technologies and "fucking didactic educational .MOV files" in order to avoid being 'seen' by biometrics. However the critical perspectives on biometrics that this group of artists generates has been criticized within the humanities: Joseph Pugliese has described the glorification of biometric failure as naïve and privileged (75); Torin Monahan has described it as universalizing (162), aestheticizing (160), and "inviting a playful dance with [surveillance]" (171); And Patricia De Vries has pointed out that Blas' art inserts a reductive dichotomy between humans and machines (81).

I will expore a different understanding of this art of disappearing. Much can be said about the tendency of academic research to ignore or devalue artistic knowledge production. In this case, however, what is being devalued is not only artistic knowledge, but a particular kind of knowledge produced by a branch of the digital humanities which has been called *transformative digital humanities* (Lothian & Phillips), operating between disciplines such as art, activism, software design and academic critical thinking while exploring contemporary digital media. The

aforementioned artists, then, are researchers as well – even with a thorough technical and practical understanding of biometrics. This is ignored by more traditional research positions, which consequently become blind to the perspectives that more close and engaged readings of the art of disappearing might enable.

I am not suggesting not to be critical when engaging with these works. Rather, what I am suggesting is to consider that the knowledge produced by these artistic research positions might be of great value to the overall research on biometrics. What would happen if we treated these examples for what they are: knowledge structures in line with, albeit not entirely similar to, other theoretical research texts? This article should be seen as an experiment to do exactly that; as an example of what additional perspectives can come from doing so. Therefore, I analyze Zach Blas' *Face Cages* (2013-16) and his "Fag Face" mask from *Facial Weaponization Suite* (2011-14) as part of a larger theoretical formation. I aim to show how doing this brings about close attention to the aesthetic qualities of biometrics, which I argue is critical to enable thinking beyond biometrics. What I call attention to is that biometrics produces, after all, an *aesthetics*, and that it should be treated as such. I thus reclaim biometrics as aesthetics in order to shift our perspective from the technical media to the narratives we inscribe in these media and the aesthetic output enabled by that. This leads me to claim that activating a counter-biometric aesthetics is far from naïve. On the contrary, engaging in the aesthetics of biometrics might be a rather clever, valuable and urgently needed research strategy for dealing with the physiognomic renaissance biometrics brings about. In other words, I am attending not only to the aesthetic value of the particular artworks mentioned, but to the value of humanities research more broadly through its attention to the aesthetics of contemporary technology.

## A physiognomic Renaissance, or what is the problem with biometrics?

Digital biometrics has a long, troubled history. It is not the aim of this article to provide a comprehensive overview of this history, since this has already been covered. But in order to clarify the problems with contemporary biometrics, I will give a brief survey of its genealogy to explain how digital biometrics can be perceived as a *physiognomic renaissance*. Joseph Pugliese (2010) and Btihaj Ajana (2013) trace digital biometrics back to a series of biometric prototypes. Pugliese goes as far back as 500 BC, when "potters pressed their fingerprint into their finished work as signs of their individuating identities" (26). He highlights a series of identity systems developed throughout history such as medieval skin-readings (26-27), renaissance mappings of the ideal body like the ones made by Leonardo da Vinci (28), and the pseudo-sciences of the 18th, 19th and 20th centuries: physiognomy, phrenology, eugenics, and anthropometry (35-45). These prototypes, which I will refer to below as *analogue biometrics*, represented certain subjects, differing from a normative white body ideal, as biologically, intellectually and morally inferior. Although Ajana focuses primarily on anthropometry and fingerprints, they both agree that analogue biometrics functioned as biopolitical control apparatuses. The representations they produced were used as a means for justifying discrimination, criminalization, colonization, violence, and in some cases mass killings. For example, theologian Johann Kaspar Lavater produced

a physiognomic system and manual for reading faces as can be seen in figure 1.

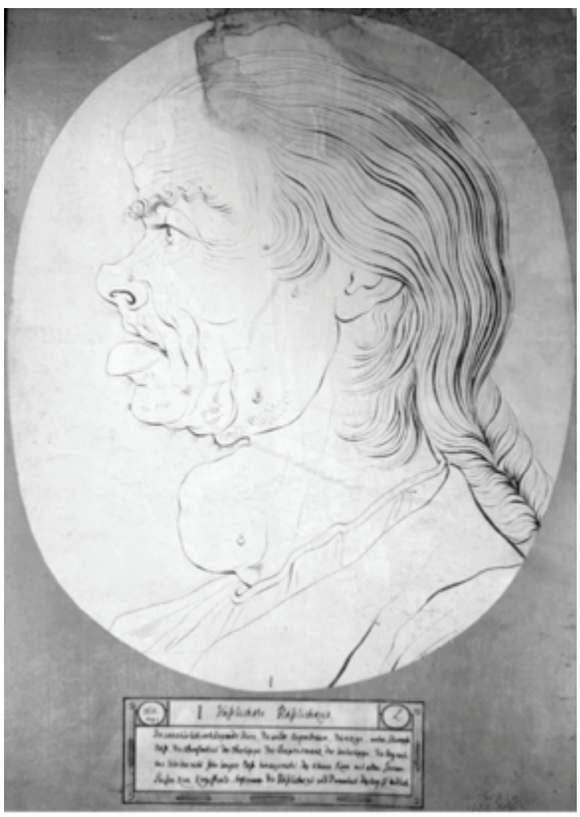

**Figure 1: Johann Kaspar Lavater, "The Ugliest Ugliness" (1796).**

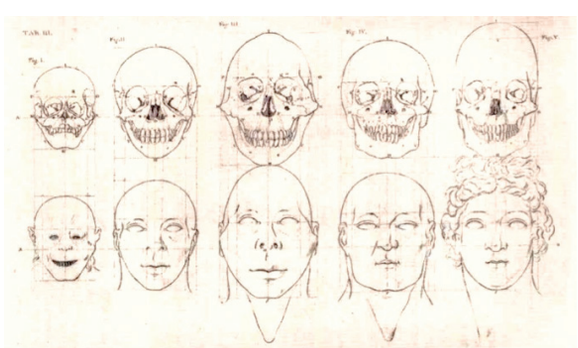

**Figure 2: Petrus Camper, "From Ape to Apollo Belvedere" (1821).**

The text beneath the image says:

> *The unnaturally prominent forehead; the wild eyebrows; the angular and blunt nose; the lacking upper lip; the preponderant lower lip, which almost reaches the end of the rather short nose; the small chin becoming a goiter; [all these characteristics] determine ugliness and stupidity. The eye is goodish. (Wegenstein 10)*

As one can tell, this biometric system not only claimed that it is possible to read faces like open books – that you can judge the book by its cover – but also that some appearances signaled less value than others. Face readings became quite popular. According to Lucy Hartley they quickly evolved into a European epidemic, which lead to the use of masks in public spaces as a means of protection against the readings (42). Analogue biometrics began establishing a hierarchy of faces as exemplified in figure 2. This phrenological scheme created by anatomists Petrus Camper put the face of what he termed "the African" at the bottom of a biometric hierarchy, comparing it to an ape, and a male Caucasian face at the top, indicating a higher evolutionary status. According to Pugliese such representations were later used by slavery apologetics in the U.S. (33). At the same time, so called head hunters slaughtered and decapitated indigenous peoples in Australia in order to send their skulls to Europe for western anatomists to conduct such phrenological investigations (Pugliese 34-35). Later again, the biometrics of criminologist Cesare Lombroso and eugenicist Francis Galton developed biometric systems that represented certain minorities as being biologically predisposed to crime (Pugliese 51). Analogue biometrics has thus been used throughout history to devalue and violently subjugate particular subjects.

Pugliese and Shoshana Magnet (2011) have thoroughly mapped how newly developed digital biometrics operate with the same kind of normative body ideal – now algorithmically encoded in the infrastructures of digital biometrics. To take an example, an entire debate evolved around the social

media app FaceApp, which was released in January 2017. FaceApp can alter your face in ways that make you look younger or older, more feminine or masculine etc. When released, the app contained a so called 'Hot'-filter (Cresci; McGoogan). Applying this filter, the app would brighten the skin and enlarge the eyes, resulting in a "whitening" of the subject using it. This made explicit in figure 3:

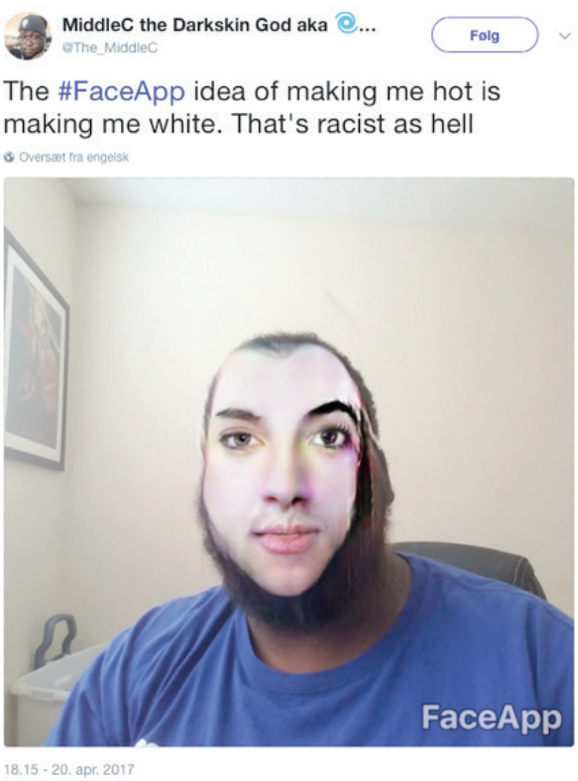


**Figure 3: Screenshot from Twitter following #FaceApp.**

In this case, the subject's face is not only altered to a whiter version – as in a haunted digital imitation of the physical decapitations caused by analogue biometrics – it is entirely replaced by a white mask; whiteness is promoted at the expense of non-white bodies. In the spirit of Lavater's physiognomy and Camper's phrenology, a hierarchy of faces occurs which deems white faces more beautiful than non-white faces. Even though these kinds of biometric representations do not directly lead to physical violence like analogue biometrics did, they can certainly be said to violate the subject. Having your face replaced with a white face as a non-white subject is representational violence. Thus, while altering our faces using media such as FaceApp what really is pulling the strings is a historically constructed normative whiteness, which not only affects our faces in normative ways, but also affects how we value human beings (differently).

Of course, as Pugliese points out, the idea is not to argue that digital biometrics produce the *same kind* of lethal violence as analogue biometrics did (74), nor to argue that corporations or states intentionally develop racist technologies that discriminate against certain subjects in some sort of conspiracy. Rather, what is suggested, is that the normative whiteness of analogue biometrics resides in digital biometrics as an *infrastructural whiteness* (Pugliese 62),[3] – an in-built normative white "goldilocks subject who is 'jussstright'" (Magnet 31) which produces infrastructural racisms. This has consequences far beyond the realm of social media. Both Magnet, Kelly Gates (2011) and David Lyon (2008) describe how biometrics since 9/11 has been framed and implemented as a tool in the hunt for the so-called "face of terror" – a deeply worrisome, stereotypical representation often targeting Arab bodies (Gates 106). Moreover, being *unbiometrifiable* (Magnet 5) – meaning being a subject that biometrics has difficulties understanding – can result in being temporarily deprived of one's civil mobility rights and free access to particular spaces:

> *For example, biometric technologies that rely upon erroneous assumptions about the biological nature of race, gender, and sexuality produce unbiometrifiable bodies, resulting in individuals who are denied their basic*

> *human rights to mobility, employment, food, and housing. Although biometric scientists often speak of "false accept" or "false reject" biometric errors, we lack language for thinking about the failures of biometric technologies to contribute to substantive equality. (Magnet 151)*

The normative whiteness built into the infrastructures of digital biometrics, then, produces racial profiling and social inequalities. By now, I hope it is clear that digital biometrics can be understood as a physiognomic renaissance, and that this is problematic because it – whether intentional or not – (re)produces hierarchical and stereotypical subject representations, racial profiling and social inequalities.

## Caught in a 'biometric box'

Humanities research covers the genealogy of biometrics and the problems raised much more thoroughly than I have been able to do here. In that way, a huge and valuable knowledge resource has already been developed. If we think of this resource as a box, consisting of the perspectives on biometrics provided by humanities research, it is possible to detect an inherent paradox. Despite the expansive criticisms of biometrics, when it comes to dealing with the problems they raise, humanities research can't seem to think outside of this box. In other words, it stays within a biometric framework. As an example, in the quote above Magnet is calling for equality to biometrics. In that way, one might say that she implicitly asks for a more democratic use of biometrics: For the biometric failures she investigates and criticizes throughout her book to be fixed. Similarly, in an article about algorithmic surveillance, Introna and Wood conclude with a bunch of solution-bullets, three of which I include here:

> A need for more detailed studies of FR algorithms with a particular emphasis on biases. We need to understand why these biases emerge and what we ought to do to eliminate or limit them. […] The development of an appropriate legal framework to prevent the misuse of the technology (especially as private installations increase). […] A very strong legal framework that prohibit or control the circulation of individuals facial biometric ('face prints') without due process. (195-196)

Here, Introna and Wood call for technical and legal adjustments of biometrics, explicitly calling to finetune the very same apparatus they criticize. Moreover, Pugliese is interested in the Japanese researchers Lao and Kawade (2004) who try to develop biometrics that are not calibrated to whiteness:

> What is interesting about this work is that it signals an attempt reflexively to integrate racial and ethnic differences into the operational software of biometric systems, and thus override homogenizing white templates. (76)

Implicitly or explicitly proposing technical and legal adjustments to biometrics in order to provide a more democratic use might be the ethical and reasonable thing to do. After all, the current inaccuracy of biometrics has problematic consequences for particular groups in society. On the other hand, these positions seem to suggest that being biometrifiable is a privilege. But is that in fact true? The genealogy these researchers present and refer to indicates the opposite. Being biometrifiable has always meant being subject to stereotypification, discrimination, violence, surveillance, and control. Indeed humanities research acknowledges that being biometrifiable today means being subject to biopolitical control:

> [T]he body is now subject to an intensification of instrumentalising techniques and procedures. As digitised bits of information, the body-as-information can now be inserted within networked relations of biopower that traverse the local, the national and the *global. The purchase on identity, in this digital landscape, has lost none of its biopolitical salience of power. (Pugliese 55)*

Here Pugliese describes how biometrics links the biological human being to the digital infrastructure, and thereby makes it amenable to surveillance, control and marketing. One might say that biometrics transforms the individual to *dividual* (Deleuze 5). Once the "living network" gets linked to the "information network" through biometrics, the subject consequently becomes subject to control, to *protocols* (Galloway & Thacker 77). As Alex Galloway and Eugene Thacker imagine:

> *In the future, there will be a coincidence between happening and storage. After universal standards of identification are agreed on, real-time tracking technologies will increase exponentially, such that almost any space will be iteratively archived over time using Agre's "grammars of action." Space will become rewindable, fully simulated at all available time codes. Henceforth the lived environment will be divided into identifiable zones and nonidentifiable zones, and the nonidentifiables will be the shadowy new criminal classes. (132)*

What Galloway and Thacker observe in the technological identity systems currently being developed, is a potential of pervasive control. With the biometric systems underway, one might begin to register a shift from Deleuze's notion of *control societies* to a notion of *hyper-control societies*. In that way, even though being unbiometrifiable is not desirable, being biometrifiable is not a favorable situation either. The paradox, then, is that humanities research realizes the control potential of biometric apparatuses, but still suggests improving them. In that way, they seem to more or less intentionally take part in reproducing the very same apparatus they criticize at length. With increasing biometric data collection across the globe – not least through social media – this finetuning must already be taking place. Biometric data are definitely accumulating quickly but this will not necessarily lead to a more democratic use of biometrics. On the contrary, you can easily imagine how adjusting and finetuning biometrics would only increase and intensify their potential for control and discrimination, fortifying the physiognomic renaissance.

This is not meant as an unambiguous critique of the above-mentioned proposals. I fully recognize the importance of the struggle for human rights and social justice when it comes to digital technologies. But rather it is meant as an initiation of an ongoing, parallel research on long-term strategies for dealing with biometrics. Strategies that take us beyond the biometric box, and beyond the reproduction of biometrics.

## Thinking outside the biometric box with the art of disappearing

How do we get out of the biometric box? This question is what originally sparked my interest in artistic responses to biometrics, because artists are working with cultivating different strategies for circumventing biometrics. Before I analyze Blas' masks, I will provide a short description of them. With

**Figure 4: Zach Blas, Face Cages #1, endurance performance with Zach Blas, 2015, Face Cages #2, Elle Mehrmand, 2014, Face Cages #3, Micha Cárdenas, 2014, Face Cages #4, Paul Mpagi Sepuya, 2016, photos by Christopher O'Leary.**

**Figure 5: Zach Blas, Facial Weaponization Suite: Fag Face Mask, October 20, 2012, Los Angeles, CA, Mask, November 20, 2013, New York, NY, Mask, May 31, 2013, San Diego, CA, Mask, May 19, 2014, Mexico City, Mexico, photos by Christopher O'Leary.**

*Face Cages* Blas investigates how biometrics affects us in a very bodily and sensuous way. As part of his investigation of biometrics, Blas has 3D-printed biometric templates and wears them together with three other artists in four performance videos.

When watching the videos, illustrated in figure 4, the faces hardly move, but if you look carefully their eyes blink from time to time, they occasionally wet their lips and their chests move up and down. The human subjects are never stable. They are very lively, organic beings. Saliva is floating. Air is entering and leaving their lungs as they breath. Their lips get dry if they don't wet them. In contrast, the metallic, glittery systems of symmetrical lines are completely stable and inorganic. They cover and stick to the subjects' faces. It looks uncomfortable, claustrophobic. These cages allude both to being detained at borders and being caught up in stereotypes. With the physical templates Blas draws our attention to the reductive representations that biometrics produce, to the clash between biometric identity and the subject. As he states:

> *[W]hen I […] tried to put it on I was really struck because it actually did not fit my face very well, and you can see there is these inner points that were basically stabbing my eyeballs (Blas, "Informatic Opacity" 51:55-52:05).*

Translated from digital infrastructure to physical object the biometric template literally hurts its subject. It almost penetrates the body, as if it wanted to cut open and lay bare what is hiding under the skin.

In *Facial Weaponization Suite*, which is the counterpart to *Face Cages*, Blas creates counter-biometric masks as a weapon against such biometric attacks. The counter-mask functions as a way of shielding oneself from biometrics' hurtful representations, much like they did in the 18th and 19th centuries to avoid physiognomic face readings. As part of his creative process Blas arranged a series of workshops in which he discussed biometrics with the participants, collected and aggregated their biometric face data and manipulated them in a 3D-modelling program (Hiscott). Contrary to the face cages it is not possible to detect any faces behind the masks in *Facial Weaponization Suite*. As figure 5 shows, they appear more organic and soft. They are colorful and almost humorous, and playful. And although they probably don't fit perfectly, there is something much more spacious and inclusive about their shape.

In an accompanying video manifesto entitled *Facial Weaponization Communiqué: Fag Face* (2012), an anonymous computer animated voice suggests using the first mask – the glossy, pink candy floss-like one – as a political tool. Evoking the political tradition of the mask – e.g. Anonymous, Pussy Riot,

the Zapatistas and Black Bloc (Blas, FWC 06:28-06:52) – Blas investigates the potential of being unbiometrifiable and uses the counter-masks to exploit biometric failures rather than trying to fix them. Wearing this mask, a biometric face recognition technology would continually slide along the smooth surface of the mask; its curves and depths, its dead ends. It would search in vain for a face in the pink, non-signifying landscape. In figure 6, a scene from the video illustrates the counter-masks in action.

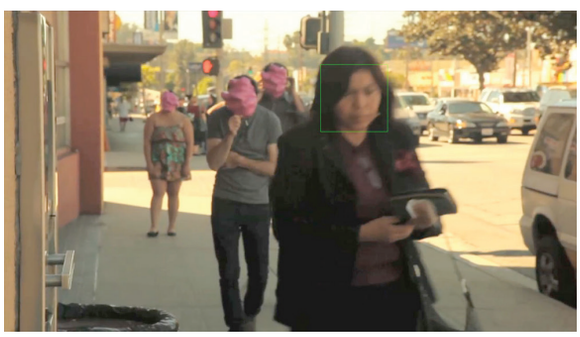

**Figure 6: Screenshot from Zach Blas' video Facial Weaponization Communiqué: Fag Face (2012).**

Looking at the picture, it seems like only the woman in the front is detected by biometrics as there are no identifying thin green squares around the mask-wearing subjects. In return, the pink masks make are even more eye-catching and visible than the biometrified woman. Watching the video, there is something disquieting about their slow-motion stroll through the city streets (Blas, *FWC* 07:18-07:25). In which city or airport would such mask-wearing subjects not be asked to take them off? Given that it is probably difficult to see anything when wearing the masks, it would be a clumsy tool in an actual political action, and bearing in mind that biometrics are able to identify subjects from many other biological traits than the face, the strategy of wearing a *Fag Face* mask seems somewhat impractical. So, what are we to do with these seemingly useless masks?

As mentioned at the beginning of this article, these kinds of masks have been criticized for being naïve and aestheticizing. As Torin Monahan states:

> *In the case of the examples covered in this paper, it is clear that while some of the signifiers of critical art are present, for instance with the Fag Face Mask's blurring of institutionally imposed identities, the primary message is nonetheless one of accommodating pervasive surveillance and inviting a playful dance with it. Recognition of the violent, unequal, and marginalizing applications of surveillance is bracketed or denied in the presentation of universal, neoliberal subjects in search of a modicum of (fashionable) control over their exposure.*

What I want to point out in this quote, is Monahan's phrasing: *playful dance with surveillance* and *fashionable control over exposure*. With this, Monahan first of all implies that because the artists are white men – here one might notice that he has chosen not to include women artists like Heather Dewey-Hagborg – we are dealing with privileged artistic play rather than the precariousness of being unbiometrifiable. Monahan here considers the art of disappearing, including Blas' masks, as art, which he then identifies as either critical or not. As I have mentioned, though, the art of disappearing cannot really be detached from its underlying research practice, in which we find acknowledgement of "the violent, unequal, and marginalizing applications of surveillance". Secondly, Monahan criticizes the tools they provide for hiding as fashionable, as aesthetic objects, rather than practical solutions.

But maybe these readings take the masks too literally. What if we don't think of them as hands-on tools for solving the

*practical* issues raised by biometrics? After all, Blas is well-informed on biometric research. He has his own research practice and a thorough technical understanding of biometrics. Then, why does his art insist on disappearing? What should we read into the stubborn insistence on the practical use of these counter-masks? I suggest understanding Blas' masks as epistemological tools for opening and thinking outside the "biometric box". We can think of the masks as not necessarily meant for *actually* concealing the subject. Instead we can understand them as an aesthetic gesture, articulating a stubborn refusal of biometrics' reductive and dehumanizing conceptualizations of what a human being is, as well as a stubborn insistence on the possibility of conceptualizing the human otherwise. What we are dealing with here might not be practical but rather epistemological strategies for critically imagining difference. In other words, we can regard the masks as a creation of knowledge structures in line with academic texts, which are counteracting biometric knowledge structures, rather than reproducing them. In the final paragraph, then, I will articulate them in this this way.

## Reclaiming biometrics: Aesthetics through the mask as knowledge structure

Concerning the biometric box and current research, I am interested in the value of stepping outside of academic conventions and onto unknown grounds – even if they seem naïve. Turning to Jack Halberstam's continuation on Foucault's concept of *naïve* or *subjugated knowledges* (Foucault 7-8; Halberstam 11), I want to propose that we investigate the naïve terrain Blas' counter-masks open up. As Halberstam writes in his critique of academic conventions:

> *Indeed terms like* serious *and* rigorous *tend to be code words […] they signal a form of training and learning that confirms what is already known according to approved methods of knowing. […] Training of any kind, in fact, is a way of refusing a kind of Benjaminian relation to knowing, a stroll down uncharted streets in the "wrong" direction. […] I propose that instead the goal is to lose one's way. (6)*

Instead of confirming what we already know, and instead of learning biometric knowledge structures, what might come from inventing new knowledge structures? What could come from strolling along with Blas' mask-wearing subjects? What becomes very obvious when studying the masks, is the aesthetic dimension of biometrics. When studying the face cages, we might realize that a digital template can be seen as an aesthetic artifact much like Blas' own masks. A grid, a network, a scheme. A system organized in a particular way. On Blas' webpage one can find an interesting description of *Face Cages*:

> *When these diagrams are extracted from the humans they cover over, they appear as harsh and sharp incongruous structures; they are, in fact, digital portraits of dehumanization (Blas,* Face Cages*).*

Here I want to draw attention to his use of the word 'portrait'. Because it points to the fact that with digital as well as analogue biometrics we have always been and are still dealing with portrayals, representations,

aesthetic expressions. We are dealing with aesthetic structures, schemes, diagrams. with particular systems organized and lead by human hands. When studying the *Fag Face* mask, it becomes clear that it is possible to manipulate and use the template data to produce a very different aesthetic artifact. This artifact might seem amorphous, monstrous, anonymizing, but it is still subject to a particular system. This is not a new acknowledgement. As both Pugliese (36) and Cynthia Freeland (119) point to in their research, biometrics has always been developed in between disciplines. Scientists, artists and philosophers have tried to map the relation between body and identity since antiquity (Freeland 119; Pugliese 36). Lavater's physiognomic system, for example, used painted illustrations of facial types. Galton's eugenics used the technology of composite photography to develop his criminal types. But even though biometrics are mediated by human subjects, they pose as scientific systems revealing "natural facts" (Pugliese 38). With digital biometrics the observer and producer of the system is even more hidden, making digital biometrics seem like neutral "conduits". But even though humanities research pays attention to how biometrics has been dangerously misconceived as science, they still suggest finetuning them. Should we not instead try to escape this physiognomic illusion entirely? Instead of *training* biometric structures, allowing biometrics to become even more pervasive, should we not be doing something completely different?

Following this example, I advocate cultivating an uncompromising critique of biometrics, reclaiming it as aesthetics. Even though we can map a genealogy of biometrics, tracing its analogue predecessors – medieval skin-readings, renaissance mappings of the ideal body, physiognomy, phrenology, eugenics, and anthropometry – it is important to emphasize that biometrics as such has actually not progressively developed over time. Rather, it should be seen as the recurrence of the same line of thought, exploiting different media – be it skin, drawings on paper, composite photography, mugshots or contemporary algorithmic scanners in airports or smartphones. A new conception of biometrics, then, would reclaim it as an aesthetic phenomenon. Biometrics in that sense would cover a specific aesthetic system that feeds on technological development – on the analogue and digital media available at a given moment – in order to produce a normative representation of a human subject. Although this subject might wear different masks, dress up in different media, it is the absolute same. Every new type of media developed throughout history has seemingly enabled new aesthetic possibilities for biometrics to reproduce itself. Hence the notion of physiognomic renaissance. Today, with digital media, biometrics expresses itself and is perceived to be something new. But it is rather the media that is new, and not biometrics as such. We can still oppose, resist, and set our faces against the validity of this aesthetic. In that sense, Blas' masks could be seen as a model for research to deal with biometrics and the physiognomic renaissance.

Blas creates a temporary aesthetic interruption that makes room for other ways of perceiving the human. This disturbance may be more of an aesthetic than practical strategy for dealing with biometrics, but that does not mean it cannot be politically effective. It is of course hard to know if these kinds of artistic research projects – in comparison with more traditional research forms – reach and create change outside of the academic world. But maybe. Given that these works are exhibited in order to generate public debate, this kind of research indeed has some potential to do just that. In the end, reclaiming biometrics as aesthetics, the only strategy left might be

to counteract the dominant aesthetics with another aesthetics, insisting on alternative knowledge structures. This is an early stage of stepping into the masquerade of biometrics, its play of masking and unmasking, and of asking the apparatus to dance. According to Halberstam new knowledge can come from lingering in the naïve, the fallible and the unknowable, and so I propose that we let ourselves lose our way in the knowledge structures of the mask. I propose to play along with Blas' masks and follow through to the dead ends, to dream recklessly in the hope that we can release ourselves from the biometric box and evoke different knowledge structures that help to dismantle biometrics in the longer term.

# Notes

[1] This list is not exhaustive. For example, one might also add DNA to the list, as do Pugliese later in his book (96-97).

[2] Even though physiognomy was framed as a science, it was later refuted as pseudo-science (Kemp 106).

[3] *Infrastructural whiteness* essentially means that digital biometrics are technically calibrated to understand and therefore privilege white normative subjects.

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# KNOWING VALUES

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# EPISTEMIC HARVEST: THE ELECTRONIC DATABASE AS DISCOURSE AND MEANS OF DATA PRODUCTION

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# Introduction

The following discussion of computational capital takes the electronic database, an infrastructure for storing in-formation, as vantage point. Following a brief look into how database systems serve in-formation desires, the notion of 'database as discourse' by Mark Poster is explored and further developed. Database as discourse establishes a machinic agency, directed towards the individual in a specific mode of hailing. This mode of hailing in turn leads to a scattered form of subjectivity, that is identified with Manuela Ott and Gerald Raunig as dividual. How does dividualization emerge from database infrastructure? What is the specific quality of data, that is produced by and being harvested from in/dividuals into databases, and what are the consequences of such a shifted view?

In media theory (the reflection on the historicity and modernity of media), there have been several approaches to dealing with what an electronic database is. In *The Language of New Media*, from 2001, Lev Manovich used the term database to explore the meaning of the database from a film-based and narration-oriented perspective. He uses a very broad notion of databases along their (graphical) user interfaces, basically at one point describing the complete World Wide Web as a database (Manovich 212–237). In *The World as Database*, from 2012, David Gugerli described the operation of querying as the basic user approach to databases, providing a perspective in which databases are understood as re-combination machines of the early 21st century (Gugerli 304).

Markus Burkhardt provided the first really convincing in-depth media theoretical exploration of database models, namely the CODASYL-Network Model, the relational model and the Big Data approach in *Digitale Datenbanken – Eine Medientheorie im Zeitalter von Big Data*, from 2015. His argument explored a surface–depth metaphor, the techno-logic (apparatuses, architectures and operations) and phenomeno-logic (media practices) of databases across different logical-mathematical models, leading to a notion of database as a "cultural technique of symbolic formation *in* and *with* computers" (Burkhardt 329).

Historically electronic database technology can be traced back to techniques of collecting, sorting, saving, and exhibiting information in libraries, museums, company and government files, and similar collections. In media theory the term 'database' is in broad use, addressing both electronic databases and any other themed collection. A narrower definition is "an electronic database is an infrastructure for the structured storage of information." An electronic database is a set of software applications, that – as most infrastructures – does not exist by itself, but consists of different infrastructural stratifications. It most commonly consists of a *query language*, usually oriented toward a natural language such as English and able to manipulate sets of information in the realm of mathematical-logical symbols. This query language can be embedded into a higher programming language and in host-systems, which often provide the *user interface*. A *translation* and *optimization* component transcribes queries into machine code and names of fields and tables into memory addresses and vice versa. It optimizes complex queries to reduce the amount of read-write accesses, since each memory access prolongs the period between query and reply. Another part of the system is responsible for logging, transactional security, concurrency control, and user access rights. A basic electronic database system addresses *memory*, often on hard disk, but increasingly also on

flash memory. For the argument to be made here, the term database will refer to all kinds of electronic databases, independently of the logical model (e.g. network model, relational model, graph model etc.) they employ.

However, I will shortly introduce today's prevalent model to organize data in-formation in databases. It was developed through the 1970's at IBM (Codd). The relational database model is based in mathematics and logic, and more specifically in set theory. Since set theory turned out to be a difficult subject for the non-mathematician, the inventors began to use the metaphor of the table. The most important feature of these tables is that the contained information objects can get inter-connected through mathematical formulas. The order of the rows is irrelevant, since each row has an address – the ID-Number, or key. If you had a simple, non-relational table containing authors and another table containing books, the problem was always, how to relate a specific author to the various books, which she or he has written, while at the same time any single book could have not just one, but many authors. Using individual IDs/keys you can realize these relations and make them available to querying.

| ID | Book Title |
|---|---|
| 42 | Demons |
| 46 | Bright Light |
| 48 | Desire |

| ID | Author Name |
|---|---|
| 214 | Miller |
| 215 | Jones |
| 216 | Rich |

| ID Book Title | ID Author Name |
|---|---|
| 42 | 214 |
| 48 | 215 |
| 46 | 214 |
| 48 | 216 |

Contrary to a spreadsheet the sequential order of the entries is immaterial. In this example we see two tables and one cross-table, that allows to join rows. A query for the author Miller (ID 214) would bring up the two books which s/he has written (ID 42, 46) and a Query for the book Desire (ID 48) shows that at least to authors wrote it, Jones (ID 215) and Rich (ID 216). Since each row can have many attributes, that belong to an entity (e.g. the author), data is brought in formation (hence: in-formation) in a flat, non-hierarchical structure that is potentially endless. The quality of this model is the ability to join ad hoc, with each query, in-formation. However, itis a closed world, for which only what is included in the model, in this case the book title, the author, and the relation between both, is existing. Anything else is excluded from the database's reality.

Historically the term 'data base' emerged around managerial processes in the U.S. military in the mid-20thcentury, namely in a symposium entitled "Development and Management of a Computer Based Data Base", organized by the Advanced Research Project Agency on June 10–11, 1963. This might lead to a reading in which the emergence of database technology – as a specific German branch of media theory prefers to ascribe to all computational technology – is attributed to the field of war, whereby developing new technologies was part of a war effort. However, even if *war* provides a comparably more exciting narrative framework, it is more productive to identify the managerial, logistical dimension of information storage and processing in and with database technology, because, in large part, it reflects the broader need to deal with an ever growing amount of information in industrial capitalism from 1900 onward.[1]

## Database as discourse

American media studies professor Mark Poster has authored one of the overlooked texts in cultural theory that can be productive for media theory. He develops a longer chapter "Databases as Discourse, or Electronic Interpellations" in his 1995 book *The Second Media Age*. Poster establishes a perspective that departs from 1980's Marxian notions, which, as he puts it, were only able to address databases from the perspective of a means

of production. He seeks to complicate the Marxian dichotomies of the 'bad suppressor' on the one and the 'good suppressed' on the other hand, employing a post-Marxian understanding of subjectivity. This understanding rejects the image of a centered, coherent self to which both liberal and Marxian theories of Poster's time adhere.[2] His arguments shed light on the bio-political dimensions of databases. After examining these aspects, this paper will extend its discussion to notions of transactional meta-data production and computational capital.

Poster draws on Foucault and Althusser to delineate an understanding of the constitution of power from both action and knowledge. Poster stresses, that the analytic task should no longer be situated in action, but in language, since databases occupy the symbolic field and are *representations* of something. Extrapolating on Foucault and Althusser, he describes how language inscribes human beings with subjectivity. Language's bearing on subjectivity is also dependent on the influence of institutions. In a complex interaction, the process of *interpellations* (Althusser) inscribes ideology on subjectivity. It does so through the process of major social and political institutions "hailing" individual subjects in social interactions in a specific way. The addressee – supposedly voluntarily – subjects themselves to the internalized constraint of accepting their position of subjecthood as ascribed by the institution. However, the subjects position is never final; it stays open and up for re-negotiation and, as such, also opens the horizon for resistance and re-orientation. The hailing of the subject is embedded within a larger discourse/practice that emerges as a technology of power operating mainly through language. The establishment of this discourse/practice remains hidden from the subject and is thus prerequisite to its ability to manifest power.

From this vantage point, Poster describes the database as a "discourse of pure writing that directly amplifies the power of its owner/user" (Poster 5). Here he maintains that, in contrast to spoken language, a database is authorless in the sense that is has too many authors for their identification. Their power is mediated through the database's belonging to a specific entity, such as an institution, company, military body, library, or university. As such, this institutional affiliation produces acts of hailing the subject. Poster implies that the dissolution of authorship leads to a situation in which nobody can be held accountable for what is collected in databases and how. But authorship (or its absence) in databases does not only manifest through the collection and inscription of information. Authorship also emerges in the super-structure of a database, which pre-configures how information is stored. Authors are actively involved in all aspects of this pre-configuration, be they *administrators* who define the users' access rights; *data scientists* who sculpt the data model and allow or deny certain information to become part of the database reality and thus eventually introduce bias; *managers* who give orientation in a generalized way for the intended use; *programmers* who translate requirements into code or programming language and in this act of translation introduce their own interpretations; *engineers* who invent, install, and maintain the technological infrastructure; *user interface designers* who, on the surface, provide an interface that pre-mediates the user's intentions within the machinic depths of the computing machine where the data is stored; and *politicians* who negotiate the framework of information collection and usage in a juridical, social, and political sense.

Though I agree with Poster that the large amount of different data contributors leads to an dissolution of authorship in electronic databases, it is important to note,

that there is a limited number of identifiable creators within a respective institution. They are potential addresses of political demands that can shape institutional and discursive change.

Another agent in the field of database discourse has entered our consciousness recently – the *user*. Today with each query on a search engine, with each spatial movement (recorded by smart phones), with each act of consumption, users voluntarily and involuntarily produce data, which is *transactional meta-data*. At first glance this appears to be a phenomenon identified in the early 2000s, namely of Big Data, the promise to record *everything*. Poster reminds us that, even when credit card payment became a working infrastructure in the 1970s, tracking of (consumer) actions took place on a regular basis. The computerization of American Airlines in the 1960s gives important insight into how the use of transactional meta-data around users was deployed for an economic, competitive advantage.[3] It established a new epistemic regime that helped the company to move from yearly to monthly, to weekly, and eventually daily ticket price changes and to balance capacity utilization versus the competitors' ticket prices. (Copeland and McKenney)

In example this special mode of fragmented hailing can be observed at a driver for Uber, who has learned to trick the Uber algorithm to get more wanted drives but who is also subjected to drivees reviews, so s/he has to invest in subjectivity, such as offering a smile. Part of his/her abilities is saved in a database and can lead to different modes of hailing the particular driver (Scholz). This would be one fragmented dividual part of a particular in/dividual stored in a database. Whereas the same person on OK Cupid expresses another part of subjectivity, mostly related to sexual and relationship desires and gets addressed through this specific partiality (Rudder). Again, the same person can be a Facebook user, getting addressed through Facebook advertisement and to Facebook is a persona with those attributes stored that make sense for Facebook in order to efficiently serve advertisements (Fisher).

## Data production and extraction

The term 'surveillance' is misleading. Where liberal consciousness identifies data collection as an act of control directed toward the individual, this paper introduces the argument that data collection on the whole is not about surveillance, but about the *production and extraction* of data.[4]

What we face is a new regime of data production: a documented interpellation and recorded extraction from every participant in the social field. Each action, even the seemingly non-productive action – for instance in querying navigation systems, in acts of consumption and payment, in infrastructure usage like recording water usage in households, or even reading a book on an electronic device – has turned into an act of data production. A massive production of epistemic value has evolved from the extraction of transactional data from human actions.

In his 1489 treatise *Summa de arithmetica, geometria, proportioni et proportionalita*, Fra Luca Pacioli published a chapter called "Particularis de Computis et Scripturis" that prominently discussed techniques of double entry book keeping based on three distinct recording procedures. The first procedure was a *memorandum*, a diary with daily notes of all kinds; the second a *journal* recording single transactions; and the third a central and indexed *register/general ledger* (Lauwers and

Willekens 296–299). A succession of actions was applied to these records, effectively producing an algorithm, which ensured that each transaction was recorded *twice*. Any amount which was recorded in a specific account as debit had to be simultaneously laid out in another account as credit.

The double recording of one and the same transaction created a new semantic relation, a relation between a *periodical logic of entry and exit* and a *topical logic of goods and capital*. This meta-data production allowed for the auditing of business activities immediately and whenever needed, compared to single-entry book keeping, which may have happened monthly, quarterly, or annually. The receipt-based recording system created a paper-trace basis of trust and enabled for an increase in capital borrowing (Lauwers and Willekens; Fischer). The transaction was made explicit as subject to commercial conduct. It evolved into a datum, which produced new epistemic value.

Historically the socialization of capital was an important passage to a capitalist economy. Before this, property was bound to a single person and reflected their *individual* situation. In capitalism, capital lost its 'identity'; it became depersonalized, it became *Kapital-an-sich* (proper capital). No longer was it bound to the family bonds of the *fraterna*, rather it was collected in the new form of the compagnia, which functioned independently of personalized relationships. Behind the backs of the participants, a new social, abstract principle emerged: the purpose of commodity exchange was no longer the immediate consumption but the reproduction of *Kapital-an-sich*. Theoretician Michael Heinrich elaborates on this process as a specific form of movement:

> *The purpose of this process is a quantitative reproduction of the original sum of money. The money is not exhaustively spent. Rather it is spent in advance; it is only spent in order to subsequently acquire more of it. The value sum that executes this movement is capital. A pure value sum in itself, be it in form of money or in form of goods, is not yet capital. Also, a single exchange process does not create capital from a value sum. Only the chain of events in the exchange processes with the purpose of enlarging the original value sum creates a typical capital movement: capital is not simply value, it is self-reproducing value [sich verwertender Wert]. (Heinrich,* Kritik der politischen Ökonomie *83).*

The transactional recordings using double-entry bookkeeping thus enabled a complex and de-personalized commercial practice. Business knowledge, which until then was implicit and bound to a specific owner-individual then became explicit and independent of that person. This new transparency blended in with a larger trend of depersonalization of capital in the early Renaissance age. As economics professor Rob A. Bryer notes:

> *Every transaction can also be judged according to its effect on the rate of return on capital (profit divided by opening capital). […] double-entry bookkeeping emerged, as capital became socialized, in response to a collective demand from investors for the frequent calculation of the rate of return on capital as the basis for sharing profits. (Bryer 114f.)*

What we witness from that period on is the steady production of meta-data (in relation to profit and property) as a means of generating knowledge, which provides the individual merchant with an advantage against his competitors and which allows donors without any family relations to invest in trade.

Given the impact of transactional meta-data on economic processes from the 13th century on, the current expansion of transactional recording appears in a different light. What is currently perceived as excessive expansion of data collection (or as surveillance), is in fact the expansion of the production of a specific kind of data – of transactional meta-data. OLAP (On-Line Analytical Processing) and Big Data approaches have become these processes' machinic agents. We currently witness the early traces of another incarnation of the capitalist economy. Which new semantic relations have become established? How does surplus data change the political, social, and economic spheres? How does it change culture? How does this new epistemic quality change social mediation and media?

## Scattered, decentered subjectivities

Where is 'the subject' then situated? If we follow Foucault with Poster, the subject is continuously reconstituted through acts of interpellation (hailing).

> *When a teacher calls upon an elementary school student to answer a question, the position of the student as an autonomous rational agent is presupposed, a position that student must 'stand into' first in order to be able to answer, in order to be a student. The operation of linguistic interpellation requires that the addressee accept its configuration as a subject without direct reflection in order to carry on the conversation or practice at hand. (Poster 80)*

Since gender, race, ethnicity, class, or other categorical distinctions may adapt interpellations, database technology is absolutely suited for inscribing difference. Consequently, since a database belongs to an institution, organization, or corporation, its discourse is able to amplify the power of its owner. But here the situation of hailing is different from that of a direct teacher-student face-to-face. "With databases, most often, the individual is constituted in absentia, only indirect evidence such as junk mail testifying to the event" (Poster 90). To this example we might add the individualized, targeted advertisement and content suggestions based on former acts of consumption, or the display of algorithmically similar content based on individuals' former choices of products.

Interpellation in this technological setting means that the subject needs to be *addressable*. There are three major forms of assigning an address in database systems. While addressing the citizen of a nation through identity cards or social security numbers has long existed as a biopolitical instrument (now simply updated to its electronic potential), two other forms of address assignment have just recently emerged. The second form of address is through the user's self-announcement "I am here", by providing a login name and password. This is usually tied to some sort of previous one-time identity check, such as verifying an e-mail address, mobile phone, credit card, or home address. The third possibility of addressing is through passive means, e.g. detecting trace information that an individuals' device provides, such as browser name and version

combined with fonts installed and websites last visited. Once the subject is addressable, the database system can hail or interpellate them into its discourse. One cannot stress enough the function of the query. While the information objects (as partial or biased as the database may lay them out) represent the potentiality of being related to each other, it is the query that updates the information request.

The subject is interpellated in a discursive way that significantly departs from the modernist notion of rational autonomy. Instead, databases construct "additional social identities as each individual is constituted for the computer", depending on algorithms and data scientists grouping identities into sexual orientation, sexes, and ethnicity along commercial and governmental perspectives. The resulting discursive construction of subjectivity is formalized through an informational-mathematical model, along which the database is organized. It necessarily splits off non-formalized aspects of subjectivity. Subject constitution in database systems operates in a way that "refutes the hegemonic principle of the subject as centered, rational, and autonomous" (Poster 87) – the major resonating point in Poster's text.

If subjectivity is decentered and multiplied along its fluctuating modes of access and interpellation, how has the modernist construction of the autonomous individual then shifted and changed? At first glance we can observe a duplication of the individual in the database by the way of *reconstruction*.[5] To be more precise, we can observe the duplication of specific aspects of the individual scattered across several databases. This means, in turn, that every single database applies a different mode of hailing to the individual it references, thus constructing a scattered multiplicity of parts of the individual. Neither the database owner nor the individual knows which part of subjectivity the particular database has saved. Therefore, it is a decentralized, fragmented, potentially always combinable tool of biopower concerning the subject, driven by *computational capital* – the control over resources of computation and transactional data. Poster argues, that the individual of modernity was conscious of their own self-constitution. Now, he asserts, "subject constitution takes an opposing course of 'objectification', of producing individuals with dispersed identities, identities of which the individuals might not even be aware" (Poster 93). The fact that our bodies are always connected over networks to databases calls for another politics of the body; a body that no longer can hide from the public eye in some private mansion and that no longer is able to leave the regime of production by attending a place called 'leisure time'.[6]

## Dividual praxes

Manuela Ott and Gerald Raunig have recently proposed to use the term *dividual* for better grasping the scattered, fragmented individualities.

From Ott's perspective automated systems of suggestion and preselection[7] cause a passivation of the subject. In turn this passivated subject tries to compensate through membership in multiple virtual communities, through participation in different platforms, and through the re-distribution of their manifold expertise. The dividual participates and actively and intentionally decenters the user-subject actively and intentionally. The constant hailing for participation by database-driven platforms, according to Ott, causes the expense of time and occupation of proficiencies, which in their intensity can only be described as 'addiction'.[8] It leads to growingly dividual identities that become "consciously and subconsciously connected

with such multiplicities and co-created by such multiplicities, that the shape of one's own individuality is less and less perceivable" (Ott, *Es lebe die Dividuation!* 4).[9] The dividual thus appears as the reflection or re-investment in time and attention of the other platform participants. Since many platforms offer their services free of charge, but still need to be profitable, it is a necessity for them to address those dividual aspects that appeal to consumption and monetization. They thus foster a world view where the economic exchange between bodies is the preferred mode.

Gerald Raunig describes platforms such as Facebook as shaped by an expressive practice of confession. This self-expression turned self-propagation is fed by the desire for visibility (originally a sign of the desire for sociability), which again brings the private into the defensive. Sharing as a mode of existence bans the danger of invisibility. According to Raunig in many cases the developing relations can't be called *social*, rather the social appears in the negative: shit storms, revenge porn, fake news.

The concentration of Raunig and Ott's arguments on entertainment platforms may however lead to one-sided conclusions. If we equate Poster's 'scattered subjectivity' with the 'dividual', and recall the discussion about the production of transactional data, there are many more fields where to observe the dividual more closely. The dividual does not only appear during the use of entertainment platforms, such as Facebook, Twitter, Instagram, and such. The database discourse/practice also interpellates the dividual when working in such different sectors like health care, logistics and delivery, industrial production, design, software programming, management, insurance, or when studying.

Interestingly Raunig turns to the database when explaining the new mode of hailing the dividual. Big Data, the collection of massive data sets relating to everything, shows little interest in the individual (aka surveillance) or in a totalization of data, "rather more in utmost floating and detailed records, which it [Big Data] can traverse dividually – as open immanence field with potentially infinite extension. The vast amounts of data aim to create an epistemic horizon, which depicts the complete past and present and thus tries to catch the future as well" (Raunig 160). Governmental actors try to reduce risk in the future by detecting deviations from expected mass behavior and base decisions of how best to police it. Commercial actors aim to minimize market risks in general and to optimize the consumption potential by hailing the dividual. While the governmental aim seems to be situated closer to 'surveillance', the economic aim fosters and makes use of the production of transactional data.

## Computational Capital as transformation belt

*Computational Capital means the disposition over data and computing infrastructure*. Computational capital aims at generating epistemic value in a specific form that is translatable into economical capital.[10] Akin to the medieval merchant's double entry bookkeeping practice, computational capital makes use of an epistemological practice – the ability to record transactional data and act upon the information generated from that data.

Computational capital has grown from a historical movement that for centuries has been closely tied to human computing. For only in the mid-20thcentury, when demand for information processing became pressing during industrial capitalism, were machines invented to do the calculation. It is often

overlooked that modelling these calculation machines followed the paradigm of human calculation. This was specifically oriented along the segmentation of labor, both physical and mental, as Adam Smith describes in *The Wealth of Nations* (Smith 12f.). "[P]hysicists and electrical engineers had little to do with the invention of the digital computer – the real inventor was the economist Adam Smith, whose idea was translated into hardware through successive stages of development by two mathematicians, de Prony and Babbage" (Simon and Newell 2).

The electronic computer became a machine capable of processing information. At the same time this machine has no understanding of the meaning of what it processes. "In the depths of digital media technologies lies, however, no natural truth, but an invisible machine calculating signals" (Burkhardt 81). Computational capital insofar only extends to the *computable* – that without meaning. This suggests that the human ability to grasp meaning cannot be separated from computational capital. Computational capital is able to work only when humans produce expressions that can be made symbolic and processed, and only when humans set up rules (algorithms) as to how the machine shall record, process, and store these symbols.

At this point it is necessary to differentiate between several kind of data in regards to, how it enters into computational capital. 1.) *Data Production* implies an active deed of creating new artefacts by combining machine or human labor with the transformation of matter. It can be observed directly in the practice of self-quantification, e.g. the measuring of a person's daily itineraries with a 'health' app, that calculates the calorie consumption from it. Data production occurs when users upload original content, i.e. their images to Flickr *and* tag it, so the abstracted data can be further used.[11] 2.) *Data Extraction* or Harvesting invokes the notion of rent, similar to the profit that is extracted from land and real estate ownership.[12] Experimentally this could be called *epistemic rent*. In platform capitalism it differs from the classical example of land or real estate rent. User-created posts on a communication entertainment platform, users' comments to a newspaper website, user-generated imagery added to a navigation application create value that is *indirectly* extracted after recording transactional meta-data associated with the subsequent content consumption by others. This form of extraction draws on novelty to maintain a stream of inter-actions that translate into transactional meta-data flowing. Involving databases, it appears as involuntary by-product to cultural creation, or more generally spoken, to human communication and interaction. Extraction also takes place, when actions, mostly in the commercial area, get digitally recorded as meta-data and produce an epistemic rent reminding of double-entry book keeping. Examples for the harvesting of transactional meta-data are platforms that broker services between different users, such as eBay or Airbnb. New with them is, that acts of exchange, which formerly have not been subjected to data-based record-keeping on a massive scale, such as selling used clothing or subletting an apartment, now become formalized and recognized as micro-economic transactions. Computational capital, however, mixes here with more traditional economic strategies, for instance in the charging of a service fee.

This emerging mode of production and extraction of data is dependent on database infrastructure and would not work without it.

In order to further progress this argument, with the above differentiation of data being tentative at least, I temporarily resort to the use of metaphors. If data is a raw material and information is a product, then it needs human labor and machine labor to

transform one into another. Like the steam engine to the spinning jenny, computational capital (calculation machines and the knowledge how to apply it) adds *productivity*. In contrast, human labor embodied in data in microscopic doses adds *value*. Data labor is barely visible from an in/dividual perspective and goes largely unacknowledged, because of the microscopic and fragmented nature of each information object for which it has been spent. This may be one of the reasons why public discourse is aligned along notions such as the most current technology (Blockchain, AI and Big Data), or questions of privacy, and not along the labor aspect. However, once it has been accumulated in large databases and been harvested using algorithms, it creates epistemic value for the owner. Human subjectivity then is the soil on which the corn of the 21st century grows. Computational capital is the machinery to harvest the corn, and just when the collected grain has been grinded in the database mill, it has the potential to be sold (that is to realize its value) or to be invested.[13]

I have explored, how the discursive power of database systems lies in their ability to interconnect pieces of information, put them in relation to each other and constantly re-arrange this epistemic arrangement according to a query and it shows, that *querying becomes a dividual practice itself*. Querying here takes on a double identity: The query is a discourse/practice in itself and translates into power. Yet since it often produces transactional data, the query is at the same time subject to discourse/practice and thus power.

From this perspective, not being subject to the recording of transactional data may be a strategy of empowerment. There have been quite a few attempts to empower the in/dividual that is subject to transactional data extraction. Hacking, proxying, digital detox, pattern-smudge, these are all strategies directed towards an in/dividual solution of a problem that is perceived as 'surveillance'. Shifting the perspective from surveillance towards *transactional data extraction/production in electronic databases* shifts the thinking around countering strategies, because it shifts the perception of the problem from an in/dividual to an institutional one. This shift may turn out as relevant to policy and activist actors who deal with issues such as privacy, data in general, and data production in particular. It also re-positions the thinking about electronic databases towards a tool of machinic agency, infrastructurally embedded into institutional and organizational contexts, which are far from unalterable. They can be politically addressed and challenged. However, in the course of my research it became obvious, that the state of data from the perspective of epistemic value is precarious. Further research into these modes (production, extraction and possible others) and the notion of rent is necessary.

I have shown that demystifying databases means interpreting them as institutional or organizational tools of hailing, addressing, agency and data production. Databases and algorithms are not first and foremost technology, they rather represent human ideas about potential (inter)actions. Databases amplify institutional power, since they are able to address the dividual on an individual level. They do so based on the transactional recordings of former acts of the addressee. Databases make up an infrastructure for the recording, extraction and production of data and meta-data, transforming human interactions from a perspective that seeks to generate epistemic value. A critique of Database systems – understood as a set of agency praxes – does not begin with the demand for privacy or the deletion of data. It begins with addressing the query and its institutional context, which represents the shaping of an informatory request as a dividual practice.

# Notes

[1] For instance, one of the papers at the 1963 data base conference stresses its objectives: “1.) Meet manpower requirements with personnel; 2). Maximum utilization of skills; 3.) Improve career management; 4.) Interrelate personnel activities” (Swanson 2).

[2] For the sake of his argument, Poster simplifies the matter. At the time of his writing, more complex subject constitutions were already available, both in post-Marxist theory, such as in Deleuze/Guattari or the Post-Operaists, and in liberal theory such as the Actor-Network theory of Callon/Latour.

[3] An in-depth discussion of the notion “transaction” and how it is embodied in databases, is developed as a chapter in the author’s Ph.D. thesis. Castelle discusses transaction in relation to database technology (Castelle).

[4] The framing of data recording as surveillance is a *strong narrative*, adhering to libertarian ideology, both in theory, pop culture, and politics. It provides a vulgarized, digestible explanation on an individualistic, narcissist level for the black-boxing of database systems, or more broadly speaking, of calculatory infrastructure. Of course, surveillance takes place as policing different societal levels and in that form has become a biopolitical practice (Foucault).

[5] On entertainment sites such as Facebook, Twitter, or Instagram, fake profiles are worth significantly less than identity-verified, aged profiles with three or more years of online activity.

[6] Leisure time today has turned into an intensified period of transactional data production when using any kind of electronic networked devices for entertainment media consumption (Facebook, Twitter, Instagram, YouTube, Pornhub, Tinder, Netflix) and other recreation that involves acts which can be electronically recorded.

[7] For instance, this includes the search field that makes proposals for how to complete a query, the auto-completion function for typing in smart phones or product suggestions derived from former purchases.

[8] Notorious for this addictive behavior is the attention seeking ‘dark design pattern’ of a red circular surface with a continuously updated number, which signals the number of unattended messages. The darkness of this design pattern lies in the fact that each attended message leaves a data trace of either being ignored or deleted or of new activity generated when one replies.

[9] Actually Ott’s impressive development of the notion of the »dividual« is much more complex. Departing from Spinoza and Deleuze she discusses dividuations as a theory of participation from several perspectives such as bio-technological, socio-technological and aesthetic-artistic dividuations. (Ott, *Dividuationen: Theorien der Teilhabe*)

[10] The notion here is developed in a similar way to Pierre Bourdieu’s social and cultural capital, which builds on Marx’s notion of capital (Bourdieu). To denote capital related to the economic sphere and differentiate it from cultural, social, and aesthetic capital, the notion of ‘economic capital’ is used in relation to Bourdieu, but as reconstructed by Michael Heinrich and Moishe Postone. (Heinrich 1999; Postone)

[11] By tagging an image, users ascribe meaning. That's something the machine can't do by itself. Machine learning training sets like *Faces in the Wild* are composed from these open sourced tagged images.

[12] An indication of the rocky theoretical territory discussing epistemic 'rent' that lies ahead can be found in (Haarmann) and (Fisher and Fuchs).

[13] This analogy throws further questions regarding the legal status of data. While the ownership of land, which was established centuries ago by dispossessing the commons through the Aristocracy, under current conditions is secured juridically through proprietary law, in/dividual data is only juridically addressable through privacy law.

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# ECONOMY, KNOWLEDGE AND SURVEILLANCE IN THE AGE OF THE CRYPTOCENE

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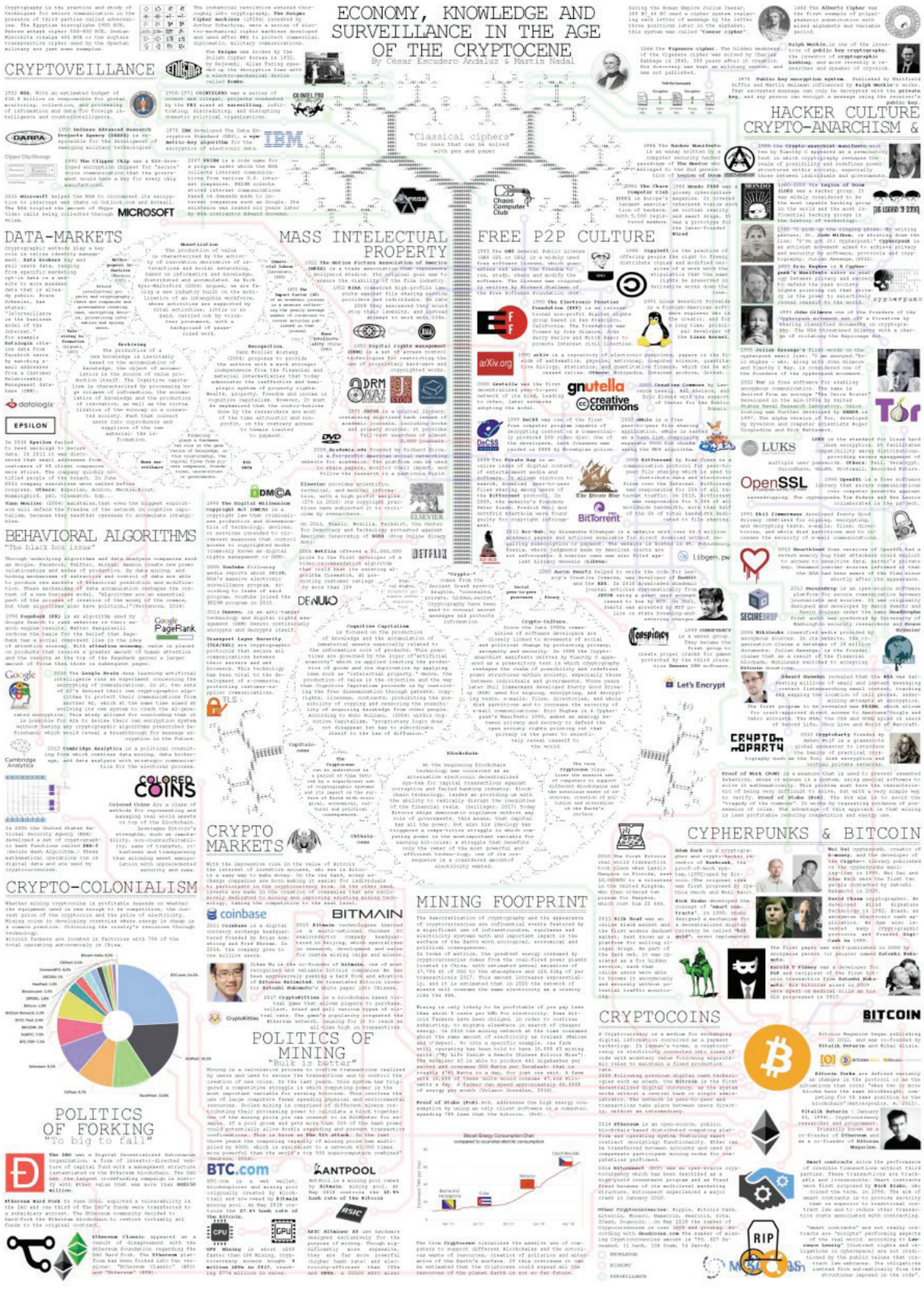


**Diagram_Cryptocene, download at http://www.aprja.net/wp-content/uploads/2018/06/Diagram_Cryptocene.jpg**

Nowadays, knowledge has been placed at the service of production, describing a new expression of power generated by the accumulation of information in the networked world. This historical context of relations between intellectual property, piracy, consumption goods and homogeneity of money is counterbalanced by cultural movements and communities defending the open society, proposing free access to information and speculating with non-monetary futures.

## Cognitive Capitalism

Following the earlier phases of mercantile and industrial capitalism, this phase of capitalism has been named "Cognitive Capitalism". Associated practices are focused on processing huge volumes of information, the accumulation of knowledge and the virtualization of the economy in a connected society.[1] These facts convert users into co-producers and suppliers of the raw material: the information. Moreover, in Cognitive Capitalism the production of value is the objective, and the way that proceeds is by restricting the free dissemination of information through patents, copyrights, licenses, contracts, prohibiting the possibility of copying and censoring the possibility of acquiring knowledge from other people, applied by limiting the production of goods and its duplication and by laws such as "intellectual property."[2]

## Open source communities

Consequently, this attempt to privatize the common and to transforms knowledge into goods collides with the incessant non-profit activity of communities of Open Software Developers, researchers and artists. Since the late 1980s[3] these communities are closely linked to movements of social and political change by protecting privacy, anonymity and security. In 1988 the *Crypto-anarchist Manifesto* written by Timothy C, appeared as a premonitory text in which cryptography reshapes the realm of possibility and redefines power structures within society, especially those between individuals and governments. Three years later Phil Zimmermann developed Pretty Good Privacy (PGP) used for signing, encrypting, and decrypting texts, e-mails, files, directories, and whole disk partitions increasing the security of e-mail communications. Eric Hughes in *A Cypherpunk's Manifesto* (1993), makes an analogy between privacy and secrecy to defend the open society rights, pointing out that privacy is the power to selectively reveal oneself to the world.[4]

According to Maurizio Lazzarato, "Perhaps for the first time in the history of humanity, artistic work, intellectual work and economic work on the one hand, and consumption goods, appropriation of knowledge and values-beauty, on the other, demand to be regulated by the same ethics." However, behind intellectual property and cryptography there are companies and governments creating laws, encrypting devices, privatizing information and spying on users. This new paradigm directly influences the concept of culture and its modes of production, socialization and appropriation. In agreement with Olivier Blondeau (2004), this informational capitalism has rejected solutions and embraces the automation of knowledge, destabilizes traditional pay structures, and assures an absolute dominion over immaterial merchandise. As Nick Dyer-Witheford (2004) argues, we are facing a new industry built on the mobilization of an intangible workforce, whose activities are supported by vital activities, with little or no pay, carried out by

volunteer prosumers, against a background of pauperized work.

## Cryptocene

In 2001 the United States National Security Agency (NSA) developed a set of cryptographic hash functions called SHA-2 (Secure Hash Algorithm.) These mathematical operations run on digital data and are used by some cryptocurrencies. The democratization of cryptography and the appearance of cryptocurrencies are probably the most influential events of what we have called the 'Cryptocene'. The Cryptocene can be understood as a period of time featured by a significant use of cryptographic systems and its impact on the surface of the Earth with ecological, economical and political consequences. The term Cryptocene visualizes the massive use of computers to support different Blockchains and the notorious waste of resources, creation of pollution, and alteration of the Earth's surface.[5] In terms of metrics, the greatest energy consumed by cryptocurrencies comes from the coal-fired power plants located in China, with estimated annual emissions of 17,796 kt of CO2 to the atmosphere and 123.31 kg per transaction in 2017. This amount increases exponentially, and it is estimated that in 2020 the network of miners will consume the same electricity as a country like the USA. If this situation continues it can be estimated that the Cryptocene could consume all the resources of the planet Earth in the not so distant future.

## Notes

[1] P2pfoundation.net, http://wiki.p2pfoundation.net/Cognitive_Capitalism.

[2] A key point in this struggle to maintain intellectual property, took place in Geneva, in December 1996. This was carried out to reduce the public domain, to reinforce its private appropriation and to break the balance between those who hold intellectual property rights and users. See Olivier Blondeau's *Génesis y subversión del capitalismo informacional: Capitalismo cognitivo, propiedad intelectual y creación colectiva* (2004).

[3] A further reference is when IBM developed The Data Encryption Standard (DES), a symmetric-key algorithm for the encryption of electronic data. In this moment cryptography focused on new algorithms and computers. It is what is known as "strong cryptography". In 1975, the American cryptographer Whitfield Diffie developed "public-key" cryptography.

[4] A 'cypherpunk' is an activist movement aimed to achieve privacy and security by software, protocols and cryptography. See Julian Assange's *Cypherpunks: Freedom and the Future of the Internet* (2012).

[5] The term Cryptocene could be conceptualized in the context of the environmental crisis. See Haraway's *Anthropocene, Capitalocene, Plantationocene, Chthulucene* (2016).

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# UNPACKING ONLINE STREAMS

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# Introduction

At face value, streaming services have often been associated with smoothness and steady supply. Drawing on metaphors of aquatic flows and currents, streaming evokes an imagery of data as a peaceful and precious natural resource. Yet below the seemingly calm interfaces of platforms, complex data arrangements reside—data arrangements that absorb users into circuits of capital and link together data infrastructures across vast geographic distances. In 2016, it was estimated that mankind produced a staggering 71.3 exabytes of Internet traffic per month (Cisco), and significant part of this data traffic originates from streaming services, who now make up a multi-billion dollar industry with wide-reaching environmental impacts (Greenpeace "Clicking Clean: A Guide to Building the Green Internet"; Avgerinou, Bertoldi and Castellazzi).[1]

Currently, one of the world's most influential streaming services for music is Spotify—a company that administrates the listening practices of over 70 million paying subscribers, and a total of over 140 million active users around the globe (Plaugic). Spotify exemplifies how streams "are highly capitalized and… [operate] at massive scales under the contemporary conditions of a globalized economy" (Soon 195). In 2016, it was reported that Spotify handles more than 38 terabytes of incoming data per day, while simultaneously storing more than "70 petabytes of… data about songs, playlists etc." (Sarrafi). During 2016, Spotify also declared that its backend system was capable of pushing more than "700 000 events per second halfway across the world," where an event refers to any action being performed by a user on the Spotify client (Maravić). Given that Spotify's paying customer base has more than doubled since 2016 (Plaugic; McIntyre), the scope of these data transmissions are significantly larger today. In short, Spotify exerts great logistical power over global music consumption.

This article reflects on the visible and invisible layers of data traffic that permeate streamed music distribution on Spotify. Drawing from studies of media infrastructures (Blok et al.; Larkin; Parks and Starosielski edt.), it explores the kinds of data transmissions that a single play on Spotify can trigger. In doing so, it seeks to highlight "the extensive, patch-worked, and varied electrical infrastructures that undergrid world processes of mediation" (Parks "Stuff You Can Kick" 364). A focus on data infrastructures—that is, digital environments that are built to handle data logistics and "coordinate, capture, and control the movement of people, finance and things" (Rossiter 4)—involves a move away from studying content and towards investigations of materiality, distribution and territoriality. To borrow from Christian Sandvig, it implies paying attention to how technologies work, rather than what people say with them (90). How might we begin unpack and intervene in Spotify's streamed data infrastructure? By what means can the nature of streamed network transmissions be explored?

In times of exceeding data growth, I suggest there is value in resisting the push to approach network infrastructures at scale and at the heightened speed at which they operate. Alongside efforts to amplify the scope and pace of our observations, we also need to find strategies of slowing down and zooming in on data traffic. Lisa Parks suggests that one way of unpacking "the physicality of distribution and the dynamism of media infrastructure" could involve "isolating moments in which content is in the process of moving from one site to another" ("Stuff You Can Kick" 359). Inspired by this approach, I suggest we begin infrastructural

investigations in the domain of data packets—that is, the small units of data into which online communication is generally split. This article considers how packets can serve as an entryway for considering the organization of digital streams.

I begin by briefly outlining the theoretical and methodological frameworks that have guided this research. Next, I discuss the technological fundamentals of packet switching and streamed content distribution in order to lay the groundwork for an understanding of how packets are situated within media infrastructures. By drawing from an experiment that involved capturing and analyzing packets with the help of software called Wireshark, the article then introduces two areas where the analysis of packets help to unpack the infrastructural agency of Spotify. On the one hand, I suggest that packets can assist in mapping the multiplicities of actors that are involved in streamed content transmissions. Thereby, the analysis of packets also functions as a corrective to simplistic descriptions of online services, and illustrates the layered nature and environmental effects of services like Spotify. On the other hand, I suggest that packets can serve as an entryway for problematizing the notion of smooth and frictionless streams. Packet analysis points to the redundant and flawed nature of digital content transmissions and thereby help us reach a deeper understanding of the messiness of online communication. Ultimately, I suggest that the small and humble packet can serve as an entryway for critically scrutinizing data infrastructures.

## On packets, streams and data infrastructures

Infrastructures facilitate the movement of goods, people, and ideas. Thereby, they also play a key role in regulating everyday life. In recent years, a large body of scholarly work has inquired into the histories and politics of digital media infrastructures, with a focus on issues such as materiality (Parks and Starosielski), poetics (Larkin), and environmental effects (Rust, Monani, and Cubitt). Building on a tradition of infrastructural studies in the field of media research, social anthropology, and science and technology studies (c.f. Sandvig), this research collectively highlights the importance of paying attention to seemingly mundane infrastructures that undergrid cultures and markets.

A focus on infrastructure directs attention towards issues of distribution, and the processes that support networked communications. It also alerts key questions around “who and what exactly is acting in and on specific environments, often in asymmetrical ways” (Blok et al. 17). Inspired by the practice of “breaking infrastructures down into discrete parts and framing them as objects of curiosity, investigation and/or concern” (Parks “Stuff You Can Kick” 356), this research pauses to consider how clues hidden in packets give insights into larger infrastructural arrangements. It also borrows from scholars like Paul Dourish, whose focus “is not with the physical infrastructure as such—the cables, the servers, the switches, the buildings, and so on—but with the processes at work” in network transmissions (184). I seek to excavate Spotify’s data infrastructure by back-tracking and studying the remains of machine operations that are visible in packets.

Like most online content, music on Spotify is transmitted via the Transmission Control Protocol and Internet Protocol (TCP/IP). TCP/IP ensures that all data that passes toand froman online device is broken down into small sequences of zeros and ones called packets. Originally implemented as part of the Internet predecessor ARPANET in the 1960s (Abbate), this method of splitting online messages into smaller units implies that messages are fragmented as they are shipped through digital networks. In such processes, each packet holds several layers of data. The top layer contains transport oriented information about where packets are bound, while the bottom layers contain the actual cargo of the packets. The bottom layers also come with mechanisms for controlling that packets arrive in one piece, and information concerning how different packets fit together.

According to TCP/IP, packets do not travel along pre-defined roads from point A to B when they are sent across networks. Instead, information is forwarded through several nodes and connections, based on a series of automated micro-decisions (Sprenger). This process is called packet switching and implies that packets take different routes on their journeys through media infrastructures. As Tiziana Terranova once wrote, “the communication of information in computer networks does not start with a sender, a receiver and a line, but with an overall information space, constituted by a tangle of possible directions and routes, where information propagates by autonomously finding the lines of least resistance” (65). “This”, she further argues, ”produces a space that is not just a ‘space of passage’ for information, but an informational machine itself—an active and turbulent space” (ibid.). No one knows precisely which path an individual packet will take on its journeys, and an original message is never complete until all packets have been reassembled at their final destination.

This basic setupwas originally deployed to safeguard against enemy disturbances under the threat of the Cold War (Abbate). By transmitting messages in automatized, distributed and unpredictable ways, a network becomes less susceptible to failures along its nodes. Yet while this arrangement has paved way for time- and resource efficient data transmissions, it also implies that content transmissions have an ephemeral existence that makes them challenging to grasp and study.

## Unpacking streams

One way of entering the substrate of streamed content transmissions—and studying data infrastructural arrangements—could involve eavesdropping on network traffic using packet sniffers. A packet sniffer (or network protocol analysis tool) is a software solution that makes visible the plethora of data transmissions that occur below the interface of a service like Spotify. It does so by placing itself between a digital device and the wider Internet, thereby capturing the data that passes to and from a selected device. In this way, packet sniffers can be used as entryways for mapping how content is amassed, packaged and shipped off during streaming sessions and other types of online content transmissions. Packet sniffers are also frequently used for diagnosing network problems, detecting network intrusion attempts, gathering network statistics, and evaluating the effectiveness of security systems like firewalls or spam filters. In some cases, packet sniffers are also deployed to spy on unprotected Internet users since they enable eavesdropping on every computer that is connected to the same WiFi network. [2]

In order to explore Spotify's infrastructural entanglements, a packet sniffer was repurposed as a digital research tool (Rogers; Sandvig and Hargittai; Soon), and used as an entryway for 'listening in' on streamed data traffic.This implied that careful measures were taken to not collect anyone else's private communication details, except for especially assigned Spotify accounts. The packet sniffer used was Wireshark—one of the world's most popular tools for monitoring network traffic. Wiresharkis free to use and download and was first created in 1998. At the time of this writing, it has been developed by 1,316 open source contributors (and counting). According to its founders, Wireshark "lets you see what's happening on your network at a microscopic level" (Wireshark). What the program essentially does is to provide detailed live captures of data traffic. Thereby, it also decelerates streams and makes visible packet transmissions that are normally hidden from the user. In the words of Wendy Chun, packet sniffers disclose how "your computer constantly wanders without you" (3). Here, the constant background activities of software become visible.

In the remaining parts of this article, I consider how a close reading of packets and packet transmissions open up for critical considerations of data infrastructures. The packets studied were intercepted from Stockholm, Sweden during two Spotify streaming sessions that lasted for 20 minutes each. During these sessions, a series of five songs were played on one Spotify free account and one Spotify premium account. Meanwhile, packet transmissions were captured using Wireshark. All plays were activated manually and careful measures were taken to make sure that only Spotify's data traffic was monitored.[3] The collected data provides a snapshot of what Spotify's data infrastructure looked like at a particular location and point in space and time, and resulted in a capture of 13,271 different Spotify-related packets which made up about 12 megabytes of data in total.

In what follows, I discuss two areas where such packets invite for considering Spotify's infrastructural connections. These areas include exploring third-party software entanglements, and problematizing the notion of smooth streams. In presenting these topics, my intention is not to suggest that packet sniffing could help us reach an inner essence of truth with regards to the organization of data infrastructures. Packets are seldom fully transparent and their cargo is often encrypted and hidden from view. Packet sniffers can also only access the last (or first) destination of incoming (or outgoing) data. In this way, a study of packets must involve recognizing the limits of what we can see with regards to online data transmissions. Packet sniffing remind us that full knowledge of where and how our data travels remains a challenge. The departure of this research is therefore that a detailed study of packets assists in establishing a starting pointfor formulating questionsand critique about the organization of data infrastructures.

## Third-party supply chains

The first area where packet inspections can be of assistance is in mapping how actors like Spotify are entangled in supply chain capitalism—that is, complex "commodity chains based on subcontracting, outsourcing, and allied arrangements" (Tsing 148). As Anna Tsing argues, supply chain capitalism is central to contemporary modes of capital extraction and relies on the establishment of diverse, fragmented, specialized and interconnected divisions of labor. Hidden in the captured packets were several traces of Spotify's entanglements with third-party

hardware and software businesses such as Tier-1 Backbone Networks (AOL, Level 3), cloud platforms (Fastly, Google), Content Delivery Networks (Akamai, Amazon CloudFront), and programmatic advertising companies (Appnexus, AudienceScience, MediaMath, Turn, Rubicon).[4] This testifies to the hybrid nature of online services. While platforms like Spotify are often described as autonomous vehicles of market growth (Nicolaou), Spotifyis neither self-built nor self-maintained and instead relies on a vast network of software providers that aid in maintaining its streams.

For instance, clues in the collected packets revealed Spotify's use of the Ogg Vorbis Codec—an open source-solution for lossy audio compression that is run by the Xiph.org Foundation. Originally founded in the 1990's by the programmer Chris Montgomery, the Ogg Vorbis codec was partly developed as a response to Fraunhofer Society's decision to introduce licensing fees on the MP3 audio format. Currently, the codec is applied by a wide variety of streaming services, websites, online radio stations, and computer games.[5] By using Ogg Vorbis, Spotify gains access to a compression technology without having to pay costly proprietary fees. This cost-saving practice runs as a red thread across the company's data infrastructure. "At Spotify we love open source", Noa Resare, one of Spotify's 'free software mediators' proclaimed in 2014 (Resare). The Spotify client, for example, has been built with the help of more than three hundred different open-source projects.[6] While Spotify gives back to the open source community by making repositories of code available to the public,[7] the fusion of corporate and open-source software systems which became apparent through packet analysis calls for future research. Here, the study of packets allows for considering corporate appropriations of code. It also provides grounds for reconsidering the identity of online services. What, exactly, is Spotify *itself* if it is mainly made up of a patchwork of other services? How do we understand its role in drawing together and aggregating various types of software solutions?

A reading of packets also encourages considerations of how a mundane task such as listening to streamed music triggers complex entanglements with internet infrastructures. Such infrastructures are tightly linked to controversial debates around environmental damage, digital policymaking, network neutrality, and the freedom of the web. As Nicole Starosielski notes, a simple click on a computer commonly activates vast subterranean and subaquatic infrastructures where information is pushed through routers, local Internet networks, Internet exchange points, long-haul backbone systems, coastal cable stations, undersea cables, and data warehouses at high speeds (54). In the case of Spotify, an initial sense of such data arrangements could be glanced from using Wireshark. For instance, it became visible that the Spotify client had been interacting with two different Content Delivery Networks (or CDNs): Akamai and Amazon CloudFront on nearly 2800 occasions. These packets had travelled across multiple national borders, and their IP-addresses could be tied to locations such as Seattle, Amsterdam, New York, and Stockholm. In Akamai's facilities in Amsterdam, for example, the packets had been channeled through Europe's fourth largest market for data centers (Avgerinou, Bertoldi and Castellazzi 8). The trade organization Dutch Data Center Association estimates that at least 504 000 m2 of land is now covered with data center facilities in the Netherlands as a whole (DDA 16).

As Stephen Graham and Simon Marvin noted already in 2001, CDNs like Akamai and Amazon CloudFront are network constructions that bypass congested Internet

infrastructures and instead establish parallel traffic routes that allow information to reach its destination at a higher speed against a fee. Such parallel networks have clear political dimensions. They often run between high priority cities across the globe (such as capital cities) and frequently target areas with a high density of corporate activity, thus disfavoring rural regions. In fact, Akamai has been singled out as providing a private network infrastructure that serves to enhance the unequal distribution of global network connectivity (ibid.). Because of how they sell high quality Internet access to selected customers, CDNs are known for sidestepping net neutrality regulations, and thus counteracting the basic and open end-to-end principles of the Internet.

CDNs also form part of a growing cloud computing industry with significant environmental effects. Amazon CloudFront, for example, is part of Amazon Web Services—one of the world's largest cloud computing services, and the collected packets could be tied to several of their facilities in Seattle and Stockholm. The company is currently established in 56 cities across 25 different countries and controls 116 different network nodes across North America, Europe, Asia, Australia and South America.[8] Amazon thus links together several major continents across the globe, yet it mainly does so with support of non-renewable energy sources like coal, nuclear power and natural gas. In a Greenpeace report released in 2017, Amazon Web Services was described as "one of the single biggest obstacles to sector transparency" in the context of online energy use, and the company has been heavily critiqued for concealing detailed information concerning its energy footprints (Greenpeace, "Clicking Clean: Who Is Winning the Race to Build a Green Internet?" 30). While Amazon implemented a clean energy policy in 2017, the company is still ranked as one of the worst big players in the business. Relatedly, Spotify was also the streaming service for music which had the worst ranking in Greenpeace's comparison of energy use among six different online music platforms (ibid.). Only 56 percent of the company's energy use could be tied to clean energy, as compared to iTunes which ranked highest and utilized 83 percent renewable energy.[9]

By mapping and providing evidence of third-party entanglements, packet sniffing thus highlight how access to streamed music 'on demand' always implies connecting to—and relying on—complex systems of water, gas, and electricity infrastructures. In this sense, packet analysis remind us that streaming affects the biophysical world; it is entwined in complex sets of environmental relations, and it leaves behind environmental residues. Streaming—much like Google Earth viewings and other forms of software use—happens as "lands, water, electricity, heavy metals, and other materials are organized to transmit signals" (Parks, "Earth Observation" 157). The analysis of packets, thus point to the extensive material routes through which streamed content is shipped.

As a whole, Spotify's entanglements with open source projects and content delivery networks illustrate how "software systems are always intensely striated and highly hierarchical, comprised of layers that provide fertile ground for archaeological digging" (Solomon 2). Instead of operating as an autonomous platform, Spotify resembles a mixture of third-party software solutions. Here, it becomes evident that Spotify's business is organized as a stack where different software solutions are layered on top of each other (Vonderau; Bratton). To borrow from Michel Callon, Spotify may appear as a coherent, durable and independent entity, but it "enrolls a mass of silent others from which it draws its strength and credibility" (96). Here, packet sniffing may aid in "showing that

what appears to be simple or reified is in fact messy and contingent" (Gehl 37). Embarking on a detective hunt among collected data packets opens up for considering the market appropriation of publicly developed code, as well as the complex ways in which online services involve software dependencies and natural resource extraction.

## Unsmooth streams

Secondly, a close reading of packet transmissions allows for problematizing the notion of smooth streams, and instead highlight the interruptions that mark online content transmissions. While the 13,271 packets that were intercepted during the previously mentioned experiment might sound like a significant amount of data, a majority of these packets contained fairly ingenuous content. Upon close inspection, it turned out that about thirty percent of the intercepted packet transmissions had failed. While such packets did not contain a large amount of data, they were large in number. These failures were never noticed at the interface level during the data collection. For example, the client never froze, and music was played without lags or interruptions. Still, music and its surrounding data was moving in ways that were far from smooth. Erroneous packet transmissions reveal how states of breakdown continuously underlie the seemingly well-functioning interfaces of software programs. Even if Spotify appeared to be running smoothly, hundreds of minor malfunctions were taking place in its network transmissions.

For instance, Spotify made 213 attempts to establish contact with an IP address located in San Francisco and 215 attempts to communicate with an IP address in New York City without any success. In making such ineffective data transmissions known, packet sniffing opens up for considering how "technology cannot without failure" (Frabetti). Even in cases when Spotify appears to be functioning seamlessly, quasi-failures might still lurk below the surface (ibid.). These failures are not abnormalities, but rather inherent parts of network transmissions. As Florian Sprenger points out, "there is no stream in digital networks" (Sprenger 89). Rather, online traffic is traversed by breaks, ruptures and pauses.

Considering such gaps is not least important since it helps to critique notions of seamless connection. The idea of immediacy is central to the marketing of streaming services, who frequently claim to offer instant access to content. In the context of marketing, real-time streams have been endowed with phantasmatic and messianic qualities (Berry) and are "used to describe media characterized by fresh, dynamic or continuously processed content in opposition to static or archival media" (Weltevrede, Helmond, and Gerlitz 126). As Geert Lovink once put it, "realtime is the new crack" (Lovink), and streaming services are not alone in expressing idealistic notions of untroubled online communication. The notion that global network technologies cause "the annihilation of time" has not least been reified by scholars like Manuel Castells (502).

Yet streaming always involves latencies and obstructions and hence its instantaneousness is a fiction. 'Real-time' streams must be therefore understood as mediated constructs that serve to enforce particular technological imaginations (Berry; Sprenger; Soon; Weltevrede, Helmond, and Gerlitz). Failures to recognize the existence of interruptions in streams run the risk of ignoring "the operational modes of digital networks" (Sprenger 107). Here, tools like Wireshark can be used as entryways for studying the troubled communication attempts that take place between computers, as well as the

moments when software breaks down and misbehave. Such elements help show an alternative image of network transmissions that stand in contrast to the metaphor of the smooth, natural and wholesome stream.

In many cases, the packets that were captured with the help of Wireshark also turned out to be simple handshake/'can you read me?'–requests—that is, short messages that allow computers to acknowledge each other's existence in order to establish if further communication is possible. Resembling what has elsewhere been described as "phatic communication," these messages are not primarily intended to transmit important content, but rather establish bonds between agents for the purpose of maintaining social ties (c.f. Fiske; Malinowski).[10] In human language, examples of phatic communication include conventional 'Hello'-greetings and superfluous remarks such as 'nice day today.' As John Fiske describes it, phatic communication "refers to acts of communication that contain nothing new, no information, but that use existing channels simply to keep them open and usable" (Fiske 14). Building on the works of Roman Jakobson, Fiske notes that such communicative acts—which are seemingly deprived of meaning and content—are crucial in holding a community or society together. In other words, their repetitive and mundane character is far from meaningless. Generated for the purpose of cultural bonding, phatic communication keeps communication channels on stand-by.

3-way handshake interactions and acknowledgement messages between computers are an embedded ingredient of TCP/IP transmissions, and the prevalence of such messages in the captured packets does thereby not come as a surprise. Yet handshake packet transmissions point to interesting features of digital communication. In particular, wide-ranging handshaking between remote computers illustrate how humans are not necessarily at the center of communicative acts within online networks. Brian Christian and Tom Griffiths describe excessive handshaking as "the anxiety of all packet-switching protocols" and note that they frequently add up to considerable amounts of data traffic (Christian and Griffiths). Packet-switching implies that computers are programmed to continuously (and somewhat anxiously) connect and reaffirm each other's existence in anticipation for future communication. The examples of machinic phatic communication that were discovered through packet sniffing thus highlight logics of ongoing machine speech. It also invites investigations into efforts of locating users across remote global distances. Spotify usage involves continuous acts of positioning users and devices in relation to other machines in space and time; it implies becoming territorially 'known' to a wide network of computers.

# Conclusion

Brian Larkin notes that infrastructures play a dual role; they are things that "enable the movement of other matter", while simultaneously also constituting "the relationship between things" (Larkin 329). As both 'things' and 'relations', then, infrastructures connect, prompt and link together distributed elements in ways that affect their usage, visibility, and reach. Packet sniffing offers an opportunity to freeze and inspect packet transmissions that otherwise move at speeds which surpass human cognition. In this way, it assists in unpacking digital streams and exploring the data transmissions that a simple 'click' can trigger. This article has sketched out the possibilities of mapping Spotify's data infrastructure by intercepting conversations taking place between computers using Wireshark.

It has also discussed how streamed music is fundamentally entangled with the "technical, social, and organizational practices of large-scale computer-enabled information infrastructures" (Blok et al. 7), and proposed that packet sniffing provides a starting point for mapping the politics of distribution, third-party supply chains, failed streams, phatic computer speech, and the environmental effects of streaming services.

In the context of digital media, knowledge of how network transmissions are organized can normally be glanced from reading press releases and information on corporate websites. Yet such information quickly runs out of date and frequently lacks in detail. Though packet sniffing, it becomes possible to extract empirical data concerning the composition of digital infrastructural networks, improve transparency with regards to collaborations between online actors, and gain knowledge about the complex ways in which global data flows are arranged. While this experiment has far from exhausted the kinds of infrastructures that a service like Spotify relies on, it has provided some insight into the lively, complex and sometimes downright failing network transmissions that a simple click can generate.

# Notes

[1] Streamed audiovisual content generates the most data-intensive online traffic, although consumption of streamed music also contribute to the general environmental impact of online streams.

[2] This is done when packet sniffers are set in so-called "promiscuous mode" which can be used to gather sensitive information such as passwords, private email details, credit card numbers, web browsing histories, or saved login credentials from unsuspecting targets (given that the information is not encrypted).

[3] This was ensured by keeping a close eye on the computer's activity monitor, using a Wi-Fi with no other connected devices, and only monitoring the ports that Spotify uses. The data was first stored in a pcapng format and later exported to Excel and Google spreadsheets for analysis.

[4] These actors and connections were established by resolving IP-addresses through multiple IP address lookup services and crosschecking the results. For more information about Spotify's involvements with ad-tech businesses see Vonderau.

[5] Such services and games for example include Wikipedia, Minecraft, Grand Theft Auto, and World of Warcraft.

[6] The most updated list of precisely which open source-projects can be found by clicking Help > Third party software in the top menu of any Spotify client.

[7] At the time of this writing (May 2018), Spotify had published 193 different repositories on Github.

[8] See Amazon's webpage, https://aws.amazon.com/cloudfront/details/ (accessed May 22, 2018).

[9] Notably, Spotify is likely to improve its ranking as it has announced a transition to Google's cloud services which has committed to a 100 percent renewable energy goal.

[10] Thank you Johan Jarlbrink for giving me the advice to explore research on phatic communication.

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# UNRAVELLING A REGULATION MACHINE: FAKE NEWS, TOXIC COMMENTS AND "ILLEGITIMATE" CULTURE

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Computational censorship in the form of fake news and toxic comments regulation is a subject that comes up quite often in the public discourse, as a result of the volatile political circumstances on a global scale and due to the unquestionable impact of journalism on these circumstances. Public attention has been directed to the role of mainstream and other media in the formation of public opinion, either in the form of articles or in the form of user-generated comments. The purpose is to analyse and allow a deeper understanding of a project that is under development, namely, computational-censorship and to show that algorithmic regulation is not a solution, but rather another layer to a more fundamental problem.

This article examines the implications of developing Machine Leraning/Artificial Iintelligence (ML/AI) which aims to regulate the internet and we attempt to allow a glimpse into the technical aspect of the problem as a way to back arguments that could be rejected by the ML/AI research community as "non-pragmatic". Finally, it aims to highlight the absurdity of the current approach to research in this area, which is the exact opposite of the rationalism that the field claims to be embracing.

Ventures such as Google, Twitter and Facebook have revealed their intention to deal with deception (whatever this means) in the online realm while encouraging conversation (Greenberg). A case study is the project Conversation AI by Google, which has been working on Perspective, an API that uses machine learning models to assess the "toxicity" of comments online and label them. Google has already responded to accusations that the aim of the project is not to censor the internet but rather the exact opposite, namely to tackle censorship (Greenberg). But this paradoxical intervention is something that stems from the no-platformism that has re-emerged in the public discourse and which is very central to the rhetoric that underpins regulation. No-platformism online will be discussed as a form of coding and reinforcing legitimate behaviours, as well as the absurdity of the commons being regulated by the markets. However, it is worth starting with the technical obscurity of the problem that has opened the door to the illusion of a solution.

## Taming the wicked

Social problems are not strictly definable and therefore not solvable by machines and algorithms, a common property of what has been classified as "wicked" problems since 1973 (Rittel and Webber). It is worth tieing everything back to the definition of ML/ AI (quite minimal but still accurate), as the scientific field of predictions and extrapolations from data sets (Poole and Mackworth). For an ML/ AI problem to be solved, a dataset containing annotated data is needed. Additionally, a formal method of measuring the error between the predicted and actual value is required; this formal method works as a mathematical description of the problem in question. The main issue is that this requires a close-ended and well-defined problem which, in the case of fact-checking, cannot exist. In *Dilemmas in a General Theory of Planning*, the authors have classified the problems into two categories, as tame and wicked (Rittel and Webber). Howard Collins has offered a different reading to this classification by shifting attention to actions; polymorphic and mimeomorphic actions differ in the sense that the former draw from one's understanding of society (and what society means) in comparison with mimeomorphic actions which tend to not show any variation; thus, machines are defined as the entities that do not engage with polymorphic actions (Collins). This is not a

matter of how advanced the field of ML/AI is to this day or a given day in the future but rather a matter of formulating a societal issue that is not meant to be formulated.

AI research has stemmed away from its mothership of cognitive science and philosophy. It has become a playground of engineers with silicon valley flavoured "solutionism" who sometimes attempt to use ML/AI "to fix problems that don't exist, or for which there is no technological solution, or for which a technological solution will exacerbate existing problems and fail to address underlying issues…", according to Privacy International (Kaltheuner and Polatin – Reuben 3). Students land AI research opportunities, in a potentially powerful field, with a good understanding of the STEM subjects but with little background knowledge in Humanities, which offer tools for approaching and framing ambiguities. However, this is not a recent phenomenon and adding to our arguments regarding rationality Philip Agre writes in 1997:

As an AI practitioner already well immersed in the literature, I had incorporated the field's taste for technical formalization so thoroughly into my own cognitive style that I literally could not read the literatures of non-technical fields at anything beyond a popular level. The problem was not exactly that I could not understand the vocabulary, but that I insisted on trying to read everything as a narration of the workings of a mechanism (Agre 145).

What is important to note is the lack of diversity in the approach of AI research in fields that are non-technical and ambiguous; for instance, treating the problem of fake news as an engineering problem hides fallacies that might be the subject of research and debate within Humanities. The *AI Now 2017* report calls for participation from disciplines beyond computer science and engineering not only as an attempt to ensure input plurality in AI research but also as a methodology that distributes decision-making power (Campolo et al. 2).

In our case, attempting to define the problem of fact checking as a classification problem is prone to fallacies; it requires a definition of the term "fact" that admits a true or false label and, although this might be the case with facts to a great extent (e.g. "the earth is flat"), there are facts that are far from easy to categorise as true or false (e.g. "Islamic State is the consequence of….") and that would require a thorough study of the epistemology of facts. Similarly, labelling toxic comments and hate speech is equally problematic, politically and consequently, technically. Arguably, the reality is not composed strictly of facts; an automated process in journalism, for instance, would not lack the critical eye required but worse, would undermine the plurality required for journalism to qualify as journalism. On the other hand, crowdsourcing (e.g. Wikipedia) seems to have more appropriate mechanisms embedded and motivations of keeping a bias-free content (bias-free would not necessarily mean free of bias but free of hidden bias; for instance, a debate works as a bias reduction mechanism by exposing the biases).

To return to the Rittel and Webber classification, it is easy to see that the fake news, as well as the toxic comments challenge, fall into the Wicked Problem category (161-167):

> *1. There is no definitive formulation. The information needed to understand the problem depends upon one's idea for solving it. Formulating a wicked problem is the problem.*
> *2. There is no stopping rule. Because solving the problem is identical to understanding it, there are no criteria for sufficient understanding and therefore completion.*

*3. Solutions are not true or false, but good or bad. Many parties may make (different) judgments about the goodness of the solution. (See Plotzen's Caliph paper.)*
*4. There is no test of the solution. Any solution generates waves of consequences that propagate forever.*
*5. Every solution is "one-shot" — there is no opportunity to learn by trial and error. Every solution leaves traces that cannot be undone. You can't build a freeway to test if it works.*
*6. No enumerable set of solutions.*
*7. Every wicked problem is unique.*
*8. Every wicked problem is a symptom of another problem.*
*9. Wicked problems can be explained in many ways. My interpretation is that this is the dual of "no right solution" — no obvious cause.*
*10. The planner has no right to be wrong. The planner is responsible for the wellbeing of many; there is no such thing as hypotheses that can be proposed, tested, and refuted.*

Therefore, the definition of the problem, as well as the extensive research in algorithmic biases, reveals, at best, the fact that the area is known of being prone to biases. Kate Crawford, who has studied the social implications of ML for years, in the NIPS 2017 conference asked "what if bias is always going to be a problem?" allowing a glimpse into the precarious mechanisms of classification (Crawford). If this is the case, we can only assume that there has been an effort by those who promote AI regulation as a solution to brand a bias-prone service as the only rational, legitimate, universal truth provider, on the basis of the fact that AI is a black box to the majority.

## "Senator, we run ads" or the revenue paradox [1]

The second point that makes the endeavour questionable is the fact that, paradoxically, companies involved in the advertiser/consumer loop (Google and Facebook) are the ones promising to tackle the problem. Considering the economics of fact checking, It is true that automated tools for this task will reduce the cost of media companies, however, the role of human fact-checkers has been reduced (Stencel) without having being replaced by robots. This is not particularly surprising in the attention-hungry economy of the internet; emotionally charged articles are usually more profitable. The so-called data-driven development has become the dominant paradigm in the computational Ads space, applying A/B testing [2]. Such data-driven corporations are tuning their algorithms using real-time analytics following mostly the metrics related to user engagement and revenue. To elaborate on A/B testing, during the user experimentation phase, engineers observe certain metrics through data collection. These metrics can track click-through rates (number of times a user clicked when she/he encountered an Ad), revenue per impression and other behaviours that work as an approximation of the intended behaviour (in this case, the goal is to direct the user to click on ads and contribute to the revenue of the search company). If the "treatment" (the new algorithm to be tested) improves the metrics for its subset of users compared to the control group (the group subjected to the existing algorithm), it gets deployed and this results in an update of the search / Ad recommendation algorithm. The overall debate surrounding the ethics of user experimentation in AI such as A/B testing has been presented before by other authors (Bird et al.) but, in our case, the irony resides in

the fact that attempts to change the nature of the algorithm have to be compatible with the revenue model and to, therefore, maximise content profit. Will these companies deny the profits of click-baiting content when they actively turn any user less capable of resisting clicking on profitable content? An automated fact checker could harm the user engagement/revenue metrics and therefore would not be appealing to the investors who are the ultimate decision-makers.

Consequently, the ones who created the problem in the first place are unlikely to resolve it, as this is not part of their business model. A more likely scenario in this direction would be to see these ventures defining the "fake" and the "toxic" in accordance with the needs of the profit-making machine.

Indeed, the following patent, which seems to be owned by Microsoft currently (April 2018) and previously held by LinkedIn, is a good example of how this paradox passes unnoticed: The fact checking system will provide users with vastly increased knowledge, limit the dissemination of misleading or incorrect information, provide increased revenue streams for content providers, increase advertising opportunities, and support many other advantages (Myslinski). It is worth noting that the patent even attempts to define and formulate hypocrisy in an effort to identify and flag hypocritical statements (ibid).

But what is it that makes such companies invest in politics and regulation of public hysteria when they successfully capitalise on this hysteria? A possible explanation, which is more thoroughly discussed in one of the following sections, is that they attempt to come to terms with governments (see also Greenwald; BBC). Other authors such as Christian Fuchs put the emphasis on the media altogether and interpret this moral panic revolving around popular culture as an attempt to distract from the factors that gave rise to social unrest in the first place. On the other hand, endeavours such as Conversation AI and, more importantly, https://jigsaw.google.com demonstrate some active interest in regulating the political commons. And worryingly enough, Google attempts to identify radicalisation and propaganda (Jigsaw), two notions that are very central to state terrorism and colonisation.

This brings up the issue of self-censorship. It might not be important whether these companies will formulate a technical approach to the "problem", as the users themselves will offer a "solution" which will be perfectly aligned with the status quo; several studies after the NSA/PRISM revelations showed that there has been a chilling effect on search behaviour and what we read and write online (Marthews and Tucker; PEN American Center) and to tie everything back to the above paradox, it seems that where self-censorship exists, it leads to damage to the profitability of internet firms (Penney).

A final point relevant to profit-making to be considered is user experience; creating intelligent systems for regulation presupposes that the behaviour of counterfeiters is stationary (does not change over time). In other systems, such as CAPTCHA or Ad Blockers, there is an adversarial relationship between the counterfeiter and the regulating entity, forcing the counterfeiter to adapt and therefore evolve. It is true, though, that the same applies to the regulating entity, however, what is left out of this equation is the user who has become more and more "protected" and suppressed. This raises the question of whether fake news and hate speech are going to remain high on the agenda, under the threat of creating an absurd and intimidating experience for the user.

## West-centric, Liberalism driven

The third point that is indicative of the research values that underpin AI/ML development is rooted in the power relations that are reproduced by the algorithms. Although biased algorithms come to the surface regularly, the representatives of big ventures are comfortable with public apologies as they usually respond that their approach is liable to the ideas circulated online and the state of the internet as a whole (Thompson) and, worst case, the unconscious biases of the engineers. In this way, what is rarely questioned is the agenda of their research methodology and where the right to exercise authority stems from.

The above argument regarding the source of biases which attempts to pinpoint the general public consciousness as the root cause is tenuous, as it overlooks the limited breadth of the internet base and the factors behind the digital divide. We already know that the internet base is asymmetrical as certain populations and classes are underrepresented (Hopf and Picot; Goldfarb and Prince 2-15). The demographics of data in our case are infused with western rationalism, showing that they are west-centric and liberalism driven and the below screenshots of Perspective API are very explicit in this sense; western leaders' names seem to be protected from toxic comments (Figure 1) while names of other leaders do not (Figure 2). This is not surprising if we consider the new direction of racism, which is exercised on a cultural basis (Hardt and Negri 190-195). Even the fact that the term "fake news" became popularised and associated with the 2016 U.S. elections (Figure 3) and a series of European voting processes with discussions around external interventions in the background shows that the goal was

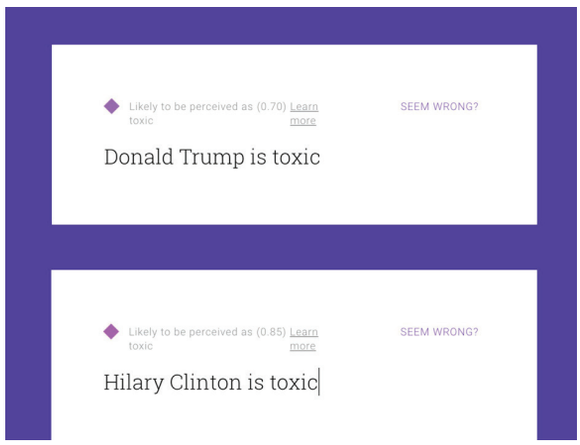


**Figure 1: Screenshot from perspectiveapi.com by Conversation AI, Google. Image by the authors taken in January 2018.**

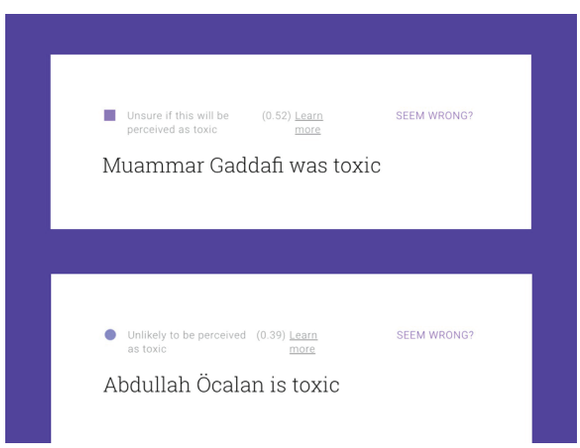


**Figure 2: Screenshot from perspectiveapi.com by Conversation AI, Google. Image by the authors taken in January 2018.**

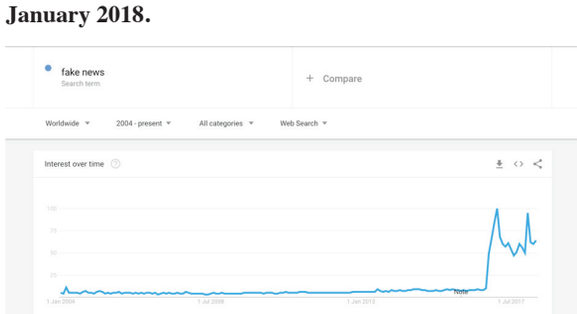


**Figure 3: The popularity of the term "fake news" on Google Trends. Image by the authors.**

not to open a conversation around values in journalism but rather to start tackling a problem that threatens the integrity of individual democracies [3]. Therefore, there is no framework that could potentially legitimise computational censorship universally and for all classes.

In other words, instead of discussing the biases of algorithms, which, in fact, does not question but endorses techno-determinism, we should start discussing the neoliberal agenda of algorithms. This is not a question of how we develop algorithms but rather how we conduct research. Focusing on biases behind algorithms depoliticise the conversation, giving the impression that this is an issue either at the level of the engineer or at the level of the user. It is the research agenda that is pro-capital biased.

One manifestation of the pro-capital research agenda is the "Move Fast and Break Things" strategy (as Mark Zuckerberg was once quoted) which is asked to be embraced by researchers and engineers and which demonstrates a quantitative rather than a qualitative and socially accountable approach (see also Taplin).

## "Illegitimate" culture

Although the above points seem to address the technical aspect of the problem, in reality, the described fallacies stem from a combination of the social, the political and the technical. The question is not whether computational censorship and regulation as a solution are adequate and efficient but the real question is, a solution to what and efficient for whom.

In the first section we mentioned that the technologies in question are not only far from being a solution, but, in fact, they add another layer to a fundamental socio-political issue. New regulation technologies need to be examined further in terms of how their intervention (that is the act of aggressively suggesting who and what will be considered as toxic and propagandistic) is constructed and how it relates to the current political landscape.

To start with the former, Jack M. Balkin analyses the anatomy of the "new school speech regulation"; this consists of "the Internet backbone, cloud services, the international domain name system ("DNS"), Internet service providers, web hosting services, social media platforms, and search engines" as well as payment systems and intermediaries. He concludes that all three structures which underpin this "new school speech regulation" revolve around indirect forms of censorship. These are *collateral censorship*, which aims at silencing an individual or organisation by regulating a facilitating entity, *public/private cooptation*, which aims at public speech via the appropriation of developed infrastructure by the state, either through direct pressure to corporations or jawboning and finally, *private governance* by infrastructure owners which appears to be legitimate, not only due to the pressure by nation-states but also due to the pressure by a number of end users themselves (Balkin, "Free Speech").

This exact indirect interaction is what makes regulation paternalistic, in the sense that it removes any connotation of suppression which has been connected with authoritarian regimes. Thus, when ventures such as Google and Facebook are taking over the role of the moderator (for reasons and in ways discussed above), declaring that they aim to hold back hate speech and fake news, they make sure that the project is communicated not as an act of submission to pressure but as a form of activism, where algorithms will reverse the deteriorating political and economic circumstances.

This exact solutionism underpins power relations and hierarchies; as Evgeny Morozov writes in *Net Delusion*, the quick fix, "taming the wicked" approach makes it tempting to apply quick fixes "more aggressively and indiscriminately" since it's a relatively cheap approach to social engineering (303). Morozov, too, referring to the Rittel and Webber classification, questions the ability of any formulated approach to wicked problems to produce universally valid solutions (308) [4]. Indeed, western media problems might not be the same as media problems anywhere else, so, there is no such thing as one solution that applies to every environment.

But this exact enforced solution "aggressively and indiscriminately" creates dynamics that are not meant to be confined to the online realm as the offline has become inseparable from the online and the technological when it comes to social life. Thus, beyond decoding the channels of algorithmic regulation, we need to ask who exactly it is primarily that will experience the workings of power relations online and consequently offline. Kroker and Weinstein in their book *Data Trash* elaborate on the different classes that we encounter in the "technotopia", with the dominant one being what they call the "virtual class". According to the authors, the virtual class is that which is determined to protect technotopia, excluding any discussion and perspective that challenges and questions "the fully realized technological society". This class acts against "economic justice" and "democratic discourse", instituting a cyber-authoritarianism (Kroker and Weinstein 4-8).

Their theory is a possible approach to understanding how classes are being regulated by incognito algorithms, with one's public presence (be it offline or online) being approved or disapproved. But it raises the question of what it means for specific classes not to be approved by these algorithms in the public sphere in these volatile circumstances, in a moment when citizens get less and less access to wealth, wellbeing and education. In the case of the AI/ML regulation technologies that are designed to detect anger, the suppressed are not only those who are already underrepresented (as mentioned earlier) but also those who are too angry to submit and show trust to the establishment and mainstream voices of the virtual class that these regulation mechanisms represent.

The answer is again offered by Kroker and Weinstein who speak about retro-fascism, "the reaction of a body that has been humiliated and marginalized by the digitalization of every communicative and social form of exchange. This reaction assumes the aspects of demented aggressive behaviors – demented, because intelligence has been entirely subsumed and absorbed under the abstract machine of info-production" (Berardi and Mecchia). In this case, retro-fascism (or simply fascism) is what occurs where a big part of the population becomes intimidated by the virtual class, as well as by an invisible intelligent entity and where modes of participation in the commons lie beyond the control of citizens but are up to researchers/engineers working for very powerful corporations.

Much of this conversation is happening in the spirit of no-platforming that has reemerged in the face of this exact volatility and the rise of the far-right but Judith Butler discussed "excitable speech", hate speech regulations and, in some ways, no-platforming two decades ago, with many of her ideas being applicable in an online context. Her arguments are certainly not one-dimensional but she suggests, in a way, that it is absurd to attempt to regulate speech when the "universally" accepted institution "is constituted through racist exclusions" which are there to assure its stability and confirm its legitimacy, as Antonio Negri and Michael Hardt would probably add (124-129). But to return to Butler, she argues that there's something

more fundamental in hate speech than the right to speak itself and this is the instituting mechanisms that generate it, hence the irrationality of the attempt to regulate it (90). In other words, hate speech is only a symptom of institutionalised exclusion and computational censorship (similarly to censorship of any kind) aims to beautify the internet, concealing only the symptoms of the unstable global circumstances.

Indeed, censorship as an idea has been connected with considering as illegitimate anything that threatens the unity and integrity of a body, hence its association with the state. But in the online realm, where there is no homogeneity to be protected against "external" factors, what is it that is threatened by fake news and toxic comments? The answer to this question might be the one discussed above, i.e. unity within this or that state in the face of social unrest and a possible far-right outburst. But beyond that, what is being protected is the integrity of the neoliberal establishment on a global scale [5].

Indeed, in July 2017, the World Socialist Web Site (WSWS) reported that Google's algorithmic updates that were aiming to make it harder for "fake news" and "conspiracy theories" to appear, dramatically reduced traffic to left-wing and anti-war websites, as well as to rights organizations. The relatively long list includes Wikileaks, Truthout, American Civil Liberties Union, Amnesty International and WSWS itself, among others (Damon and Niemuth). Google justified the action taken by explaining that their goal was to prevent "upsetting user experiences", which reveals the implications of "legitimate" and "illegitimate" political opinion online. But beyond that, although curating information in this way is not synonymous with removing information, it raises questions about whether there is practically any internet outside of Google.

## Neoliberalism as an algorithm

Claiming that neoliberalism is an algorithm might be an extravagant statement to make, in the sense that we can hardly see it as a mathematical construct and it might oversimplify a long process of institution and a more recent process that David Harvey called a counterrevolution and "a political project to re-establish the conditions for capital accumulation" (19). But its similarity to an algorithm lies in the fact that, as an ever-developing project, it relies on processes that aim to profit maximisation through competition and natural selection (survival of the fittest). Therefore, we can hardly say that the above fallacies challenge the actual logic embedded in such projects; questioning the rationality of this process altogether would mean questioning the efficiency of the profit maximisation process for the elites, something that we know is unquestionable. In other words, although the above paradoxes attempt to question its rationality, in reality, they do not challenge its raison d'être. Despite the fallacies (and because of the fallacies) demographics of data and capital can spread the western "civilised values" online, fake news can be less obviously fake and socially complex problems can be formulated, being reduced to the level of technology without affecting profit-making.

It is worth noting that authors such as Lawrence Lessig, Frank Pasquale and Jack M. Balkin see the law as the possible catalyst to disrupt "omniscience", in combination with public demand for transparency and accountability (Lessig; Pasquale; Balkin, "Three Laws"). But thinking of law as a tool against regulation might be paradoxical, especially when both are the product of the same "algorithm". However, Lessig clarifies that the question is not "regulation" or "no regulation"

as the code is regulative by nature. He suggests promoting decentralisation but at the same time, he urges us to think what kind of private interests step in when the state steps aside (ibid.).

Exposing the research agendas is not enough. This is not to say that neoliberalism must be thought as a determined, fatal condition from which there is no escape. As a final and more positive note, we can say that this condition is susceptible to the scholarship of individual researchers. Following the example of other STEM-related fields, such as that of Development Studies, the AI/ML field can be enhanced with decolonising research methodologies, teaching how they interplay with different classes, territories and political landscapes, introducing not only elements of sociology but also the political and the anthropological. This new scholarship would not take for granted and disseminate the over-productive, western, liberal rationalism, as the only principle that should underpin research. Without a more "instituted" discussion, the neoliberal algorithm proves capable of presenting itself as thoroughly researched, universally legitimate and democratic to the public consciousness, thanks to its patriarchal and patronising underlying mechanisms that are perfectly aligned with the values of a several-thousand-year instituting society.

# Notes

[1] The title refers to the response of Mark Zuckerberg when he was asked by Sen. Orrin Hatch about his business model (Liao).

[2] A/B testing refers to a process in product development where users are shown two different versions of a given service with each user accessing only one version in order to determine which version improves the metrics in question (Kaufmann, Cappe, and Garivier 461-481).

[3] U.S. Senator Lindsey Graham, Chairman of the Subcommittee on Crime and Terrorism, declared in October 2017 that manipulation of social media "by terrorist organizations and foreign governments is one of the greatest challenges to American democracy", as well as a threat to the U.S. national security. The subcommittee invited Facebook, Twitter and Google representatives to testify.

[4] Of course, what Evgeny Morozov had in mind was grassroots movements, rather than top-down solutionism but the same limitations and precariousness apply to both approaches.

[5] Here, the idea of a body that seeks to protect its unity on a global scale as it is manifested through the transnational moral panic against fake news and toxic language, is developed building on what Arjun Appadurai has defined as "Ideocide", in his book *Fear of Small Numbers: An Essay on the Geography of Anger*; the phenomenon "whereby whole peoples, countries, and ways of life are regarded as noxious and outside the circle of humanity", targeting "'internal' minorities", "whole ideologies, large regions and ways of life" (117).

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# ACTIVATING VALUES

Marc Garrett

# UNLOCKING PROPRIETORIAL SYSTEMS FOR ARTISTIC PRACTICE

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# Introduction

The cultural, political and economic systems in place do not work for most people. They support a privileged, international class that grows richer while imposing increasing uncertainty on others, producing endless wars, and enhancing the conditions of inequality, austerity, debt, and climate change, to own everything under the rule of neoliberalism. David Harvey argues that the permeation of neoliberalism exists within every aspect of our lives, and it has been masked by a repeated rhetoric around "individual freedom, liberty, personal responsibility and the virtues of privatization, the free market and free trade". (Harvey 11) Thus; legitimizing the continuation of and repeating of policies that consolidate capitalistic powers. Pierre Dardot and Christian Laval in Manufacturing the Neoliberal Subject, say we have not yet emerged from "the 'iron cage' of the capitalist economy […] everyone is enjoined to construct their own individual little 'iron cage'." (Dardot and Laval 263)

If we are, as Dardot & Laval put it co-designing our own iron cages, how do we find ways to be less dominated by these overpowering infrastructures and systems? How do we build fresh, independent places, spaces and identities, in relation to our P2P, artistic and cultural practices, individually and or collectively – when, our narratives are dominated by elite groups typically biased towards isolating and crushing alternatives? Does this mean that critical thought, aligned with artistic and experimental cultural ventures, along with creatively led technological practices, are all doomed to perpetuate a state of submission within a proprietorial absolute?

To unpack the above questions we look at different types of proprietorial systems, some locked and unlocked, and consider their influence on creative forms of production across the fields of the traditional art world, and media art culture. We look at how artists are dealing with these issues through their artistic agency: individually, collaboratively, or as part of a group or collective. This includes looking at the intentions behind the works: their production and cultural and societal contexts, where different sets of values and new possibilities are emerging, across the practice of art, academia, and technology, and thus, the world.

The meanings of the words proprietorial and proprietary are closely linked. Proprietary is defined as meaning that one possesses, owns, or holds the exclusive right to something, specifically an object. For instance, it can be described, as something owned by a specific company or individual. In the computing world, proprietary is often used to describe software that is not open source or freely licensed. Examples include operating systems, software programs, and file formats.("Proprietary Software") Many involved in the Free and Open Source Software movement, share a set of values built around its beliefs against proprietary control over our use of technology. Olga Goriunova argues that, software is not only bound to objects but also includes social relations and it's about breaking away from the fetishism of proprietary software structures, and "commodification of social processes layered into software production and operation." (Goriunova 92)

If we consider the definition of proprietorial, in the Cambridge Dictionary it is especially poignant when it says "like an owner: He put a proprietorial arm around her." This brings us directly to a biopolitical distinction. The term biopolitics was first coined by Rudolf Kjellén, (who also coined the term geopolitics) (Markus 35) and then; later expanded upon by Michel Foucault, arguing that certain styles of government regulated

their populations through Biopower. Hardt and Negri developed Foucault's ideas saying "Biopower is a form of power that regulates life from its interior, following it, interpreting it, absorbing it, and rearticulating it." (Hardt and Negri 23-24) But, as we will discover further into this text the term also reinforces a deep a psychological bias that asserts the right of the patriarch to own our social contexts.

## Locked and unlocked proprietorial systems

**Fig1. Hazel O'Connor, in the *Movie Breaking Glass*. Paramount Pictures. September 1980.**

A powerful image I will always remember from the 1980 Post-Punk movie Breaking Glass. Is when Kate (Hazel O'Connor) the talented and angry, singer and songwriter, gradually loses her agency. Whilst manipulated by the record company managers, she is grabbed, and they hold her close to them. They're not necessarily aware of how suffocating they are, but there is an obvious portrayal of ownership at play. It is through the social and managed infrastructures, and the belief systems, in which we all grow up, that proprietorial behaviours enact psychological and concrete forms of violence, from birth to the grave. Slavery and domination by the patriarch are both proprietorial systems. Murray Bookchin proposes that, even before social class emerged that "the priesthood established quasi-political temple despotisms over society, the patriarch embodied in a social form the very system of authority that the State later embodied in political form." (Bookchin 120)

If we want to find examples of what Bookchin refers to as despotisms over society. We need not look that far. For instance, the pharmaceutical industry has its own particular brand of 'high' priesthood, and proprietorial lock down; in the form of Martin Shkreli, founder, and head of Turing Pharmaceuticals where he raised the price for Daraprim in September from $13.50 per pill to $750. The drug is preferably used for a parasitic condition known as Toxoplasmosis, which can be deadly for unborn babies and patients with compromised immune systems including those with HIV or cancer. His company, Turing Pharmaceuticals AG, bought the drug, moved it into a more closed distribution system than before, and instantly drove the price up. (Smythe, Christie and Geiger, Keri) Soon after, he cut it down to $375 for some hospitals after a mass public outcry. Even, though many pharmaceutical companies held back at first and refrained from putting their own prices up, in the end they all followed suit. Shkreli's actions reflect a wider issue where the priority is monetary and feeding the markets, and health and life is low down on the list. The establishment of ever more efficient and productive systems of growth are owned by fewer, more centralised agents.

> *[I]t's the distribution of freedoms and access to sustenance, knowledge, tools, diverse experiences and values, which improve the resilience social and environmental ecologies. (Garrett and Catlow 69-74)*

Shkreli's over the top approach is part of larger already accepted condition where extreme scarcity threatens lives. In contrast, Dana Lewis has provided the world with a fresh example to bypass the assumed narrative that only the privileged can control our health and well-being. After being a member of the diabetes community for years and frustrated with commercial companies' closed and expensive approach towards diabetes, she created the "Do-It-Yourself Pancreas System" (DIYPS) and was founder of the open source, artificial pancreas system movement (OpenAPS) (Lewis). Since then, a large online community has developed using DIYPS, and advocating free and open software as the way forward. Another way to deal with proprietorial domination in the pharmaceutical industry, is to make an art project that delivers an element of DIWO and DIY into its very being. One such project is *Housewives Making Drugs*, 2017, under the name of Mary Maggic. Based on the project by biohacker biologist-artist, Ryan Hammond *OPEN SOURCE ESTROGEN*, "a collaborative interdisciplinary project seeking to subvert dominant patriarchal institutions of hormonal management." (Maggic) *Housewives Making Drugs* is a fictional cooking show where the trans-femme stars, Maria and Maria, teach the audience at home how to cook their own hormones, step by step. They perform a simple "urine-hormone extraction recipe." (Maggic) While amusing the audience with their witty back-and-forth banter about body and gender politics, institutional access to hormones, and everything problematic with heteronormativity." (Maggic)

Proprietorial domination is the presumption of ownership not only over our psychic states of existence but also through the material objects we possess and use daily, and this extends into and through our use of digital networks every day. This can mutate into forms of dependency, reliance, and addiction. Facebook, Twitter, Instagram, Google etc. – have impoverished autonomous relations to such a degree that it is becoming increasingly rare to experience an exchange or online activity outside corporate-controlled "social" zones. The digitized versions of ourselves graze away in these social networking platform pens, like cows in a field, chomping at the bits allocated to us via biased algorithms that dictate what we see and hear. Thus, our Internet experience is restricted as we abide by and exist within imposed filter bubbles. When we use these social media platforms and web browsers, our data is harvested and scraped. In a recent interview on the subject of everyday addiction to digital devices and social networking platforms, artist Katriona Beales says "Addictive behaviour is both normalized and valorised in late capitalism as it is associated with the public performance of productivity. Whilst these actions appear to be the choice of individuals, how much is due to the influence of mechanisms and systems of control?" (Beales)

This addiction is approached face on by the Tactical Technology Collective with funding support from the Mozilla Foundation, in the form of *The Data Detox Kit*. People are introduced to an 8-day step-by-step guide on how to reduce data traces online. "Each day has a different focus – from cleaning up your apps, to social media, to your phone's connectivity – informing you of the data processes, walking you through some changes you can make, and giving you a small challenge at the end of each day." (Tactical Technology Collective) Beales' critique on addictive digital behaviours, and the Tactical Technology Collectives' activities present a more recent, common distrust towards our use of social media. The current conditions can give an impression that these issues are only occurring now. But, if we look at forms of resistance going back to The Diggers and The New Levellers, what is

revealed is how deeply entwined and established proprietorial domination is, in respect to land ownership. In the British Isles, an enclosure was the act of "buying the ground rights, and all common rights to accomplish exclusive rights of use, which increased the value of the land. The other method was by passing laws causing or forcing enclosure", such as a parliamentary enclosure Act. Peter Linebaugh describes the English enclosure movement of the 1500s, 1600s and up to 1850, as belonging to a series of concrete universals, such as "the slave trade, the witch burnings, the Irish famine, or the genocide of the Native Americans." (Linebaugh 142)

The similarities between land grabbing by past elites and how the Internet has lost its potential for openness via top-down orientated, centralised platforms, is a continuation of what is a timeless battle. In an interview with Ruth Catlow on Furtherfield, Tim Waterman says, it's the "exploitation of people and resources that marks the practices of contemporary capitalism as very much a continuation of the project of the enclosures, whether it is to skim value off creative projects, to asset-strip the public sector which is increasingly encroached upon by the private sector, or to exhaust land and oppress workers in the Third World." (Catlow and Waterman) Silvia Federici, says it's no accident that "the witch-hunt occurred simultaneously with the colonization and extermination of the populations of the New World, the English enclosures, [or] the beginning of the slave trade" (Federici 164) In her comprehensive study, *Caliban And The Witch: Women, the Body and Primitive Accumulation*, Federici writes that, the emergence of the witch-hunts were "one of the most important events in the development of capitalist society and the formation of the modern proletariat." (165) And, it unleashed "a campaign of terror against women, unmatched by any other persecution, weakened the resistance of the European peasantry to the assault launched against it by the gentry and the state, at a time when the peasant community was already disintegrating under the combined impact of land privatization, increased taxation, and the extension of state control over every aspect of social life." (165)

## Moving on from divine constructions

The mainstream art world of *Frieze*, the Saatchis, and repeated biennales around the world, have for years, presented us with locked down proprietorial systems. If, we consider how and why these art institutions such as the Tate Gallery exist in the first place. A backdrop emerges, where a combination of: conservatism, colonialism, imperialism (Harvey 11), colonization, conformity, and the patriarch: have built walls around themselves, where those who do not belong to the same class systems, rarely get through, unless they perpetuate similar marketable values. The Tate Gallery's legacy is intertwined with a complex mix of ideals consisting of genius as a product, which assumes the position of presenting what is deemed as the 'best' about the nation. This is all bound in an almost untouchable divine construction, where the values of a secular and enlightened culture co-exist as universal qualities. This imagined civilization is a construct born out of a wide-ranging set of central, changing values that include, colonial wealth, Christian liberalism, social science, and ideals of the enlightenment, all sanctioned and driven from the historical achievements and exploits of the industrial revolution. These attributes convey nationalism, and a self-image with a cultivated sense of authority, where those seen as the great

and the good are given pride of place for all to admire. (Garrett)

Gerald Raunig adds another level when he proposes it to be an inherent set of the conditions imposed by state apparatuses instigated through conservative values with a historiography, that promotes processes of marginalization. We're still dealing with the consequences of these reductive "conservatisms, such as rigid canons, fixation on objects and absolute field demarcations, activist practices are not even included in the narratives and archives of political history and art theory, as long as they are not purged of their radical aspects, appropriated and co-opted into the machines of the spectacle." (Raunig 19) Anna Brzyski, argues that "the language of the canon obscures the historic existence of multiple, temporally and geographically situated canonical formations." (Brzyski 7) Raunig and Brzyski both share the position saying that these divides by the powers that be and established gatekeepers in the art world, consciously create these divisions. This process is a systemic trickling down, effectively maintaining the status quo with help by the artists themselves. For instance, it is not unusual for artists who become successful and those hoping to be successful, to edit out the lesser-known galleries, groups and projects, who were inclusive and supported them earlier on in their careers. I have looked at artist CVs as they have changed through the years and it is noticeable that, smaller scale arts organisations gradually vanish, and are replaced with better-known and established art institutions. This seemingly banal act gives even more power to these well-established bodies and promotes a myth that it is only they that supports artists. This blots out the reality of the mix of diversity and grass root ecologies actually existing in the art world. Alongside, exists a rather absolutist narrative that is promoting an art mainly in relation to market driven incentives. There is massive social inequality in the art world, which is accepted as the norm in art circles and art magazines and galleries. They may well even acknowledge to themselves and peers, that something is wrong with this, and it needs to change. But, as Morgan Quaintance so succinctly puts it, "silence, resignation or apathy are fuelled by something far more basic, comfort. Put simply, people are adverse to personal risk and lifestyle change." (Quaintance)

The recent appointment of Elisabeth Murdoch, daughter of Rupert Murdoch, to the Arts Council England's National Council, worryingly reinforces the neoliberal agenda, as it is

> *directly linked to Sir Nicholas Serota's current leadership of Arts Council England and to his wife, Teresa Gleadowe's own arts projects. […] During Serota's reign at Tate, he supported artwashing in the form of BP sponsorship, refused to recognise unions, privatised staff positions, introduced the use of zero hour contracts, presided over a culture of widespread bullying, privatised information, and, of course, Tate staff were then asked to kindly chip-in for a new boat for his leaving present! Serota's leadership of Tate lasted 28 years. (Pritchard)*

*The Panic! Report*, written by academics Dr Orian Brook, Dr David O'Brien, and Dr Mark Taylor, draws on survey data from 2015 and several academic papers into social mobility in the arts. "The cultural and creative sector "significantly excludes" those from working class backgrounds, which is in addition to barriers faced by women and people who identify as disabled or Black and minority ethnic (BME), new research finds." (Romer) And, "the report also finds the creative industries are mostly upper middle class

and with very different cultural tastes from the rest of the population." (Romer)

To change the divide there needs to be infrastructural changes, such as what punk and post-punk had in the 1980s, when the working classes were part of the cultural contexts. In media art, there are artists demonstrating through their processes how this can occur, crossing over, between art and everyday life, demonstrating critically engaging ideas that directly open up (literally) how others can hack through and around, platforms, networks, and infrastructures, in their work. For example, artist Jennifer Lyn Morone, turned the tables on data scraping social networking companies, by becoming a public trading body herself, claiming ownership of her data. Morone has claimed corporate ownership of her personal data (self), and has founded herself, as her corporation and intellectual property. Reclaiming agency whilst being immersed within data driven networks, protocols, and algorithms, constitutes a style of Post-Fordist cyborg-activism. Caronia proclaims that today's cyborg is forced into a process of capitalist growth, and sees no difference between work and leisure, "the office and the playground, and between times of public and private life." (Caronia 27) Artist and hacktivist, Heath Bunting has demonstrated since 1996, an insightful understanding in regard to biopolitical nuances involving data and its uses and how it is used to measure our worth, status, and relevance in wider society. One project of his, called *The Status Project*, is a functioning database with over 10,000 entries by individuals mainly living in the UK. From the data he has created over 50 maps with sub sections. One work to come out this larger project is his identity generating software, which is, he says, recognized under UK law as a person.

> *The machine is defined in part by Bunting as the societal mechanisms that attempt to understand and disrupt human social systems. This is most overtly seen in corporate and government surveillance and mapping of individual behaviors on the Internet, but also evidenced by any social contract whereby privacy is traded for goods or services—driver's license, credit card, store membership."(Klowdenmann)*

Although there has been a gradual move to include artists practicing across media arts, and through the intersections of art and technology. This shift is a movement initiated from the ground up, finding small cracks in what is still a closed set of systems that Felix Stalder proposes is, "created by the means of active and unauthorized appropriation [... and] opposes the dominant version and the resulting speech is thus legitimized from another – that is, from one's own position." (Stalder 32) In her book *Undermining: A Wild Ride Through Land Use, Politics, and Art in the Changing West*, Lucy Lippard says, "Writing about conceptual, feminist, and political art as escape attempts, I've concluded that the ultimate escape attempt would be to free ourselves from the limitations of preconceived notions of art, and in doing so, help to save the planet." (Lippard 9)

Lippard's comments are echoed by a younger generation of artists and techies, either taking control of technology and or examining their roles in how to deal with aspects of climate change, whilst also questioning those who build and sell technology. This extends to artists claiming their own cultural identity through their art, on their own cultural terms. This could be as geeky hackers, contemporary indigenous artists, as well as, critically focused arts organizations actively critiquing their own role in society. As a response to underrepresentation of First

Nations cultures in the Australian media landscape and internationally, artists: Gretta Louw, Owen Mundy, and Sneakaway Studio, have collaborated to build a photo editing app called Mirawarri celebrating Indigenous Australian visual culture. It combines traditional Aboriginal Art aesthetics with the vibrant, media-savvy approach of the Warlpiri artists of the Tanami region, working with Warnayaka Art Centre. When, those living in the western world suddenly stop appropriating everything they touch, this action can allow a more nuanced acceptance of other existing ecologies beyond the neurotic act of always wanting to control the context and situation.

## What am I made of?

If, we remind ourselves of land ownership and the enclosures from 1500s – 1850, and how now, people's data is trawled and scraped, and then owned by clandestine groups tracing every digital interaction. Both are non-consensus directives impacting others without their own informed choice. The point here is, it is a deliberate act of exclusion, and usually implemented before anyone has a say on the matter. This panopticon (or netopticon) of networked dominance has integrated humans into real-time, states of existences under constant surveillance. A strategy inspired by the production and distribution of *Free and Open Source Software* is that the opening up of these black box of objects; is to share information, and to understand more what was previously hidden. As we move into the age of the *Internet of Things*, it is expected that our homes will be all linked up through smart devices and smartphones, in our homes, ranging from: "temperature control, light automation, sprinkler scheduling, smart refrigerators, home security" (Chan). Although this may seem like a great concept to some, Dyne.org are not so convinced, expressing serious concerns around the vulnerability of home privacy and personal data. As an alternative, they propose a project called *The Privacy Dowse*. Its aim is to perceive and affect all devices in the local, networked sphere. As these ubiquitous devices accelerate and communicate to each other even more, having control over these multiple connections becomes even more essential. They say that more people need to understand how to interact beyond GUI interfaces, so to see who has access to private, common and public information. *Dowse* was conceived in 2014 as a proof of concept white paper by Denis Rojo aka Jaromil. The project abides with the principles set out in *The Critical Engineering Manifesto*, conceived in Berlin, in 2011, by The Critical Engineering Working Group, consisting of Julian Oliver, Gordan Savičić, and Danja Vasiliev.

> *The Critical Engineer observes the space between the production and consumption of technology. Acting rapidly to changes in this space, the Critical Engineer serves to expose moments of imbalance and deception. (Oliver et al)*

Another project exploring infrastructural contexts beyond face value, is MOCC (The Museum of Contemporary Commodities). As, part of *The Human Face of Cryptoeconomies* exhibition at Furtherfield, on July 2015, they invited people to "imagine the things they value today as the heritage of tomorrow" (Furtherfield, *The Human Face*) to reflect on the ethics of production, data, and trade embedded in the things they buy, by imagining themselves as future attendees at a museum of 21st century commodities. They were invited to join a team of volunteered researchers

and art makers to get involved in a series of walk shops, workshops, and digital art social events that ran at Furtherfield Commons and Gallery, and local other spaces in and around Finsbury Park and online. From a 9-month residency emerged the prototype, and re-purposed MoCC Guide, Mikayla, an Internet connected 'smart' doll. It was designed to appeal to young children with its long yellow hair, pink outfit and cheery voice, and respond to children's questions by consulting the web. Paula Crutchlow worked with technologist Gareth Foote to reconfigure the doll's original script to make her self aware. They made the doll talk "about who made her, what she was made from, and how she felt about the condition of almost ubiquitous digital connectivity we increasingly live in. A year after the exhibition in December 2016, in Germany, a complaint "turned the media focus from lack of personal security inherent in the object, to alleged breach of privacy by the object and its software," (Crutchlow) due to the doll constantly "listening, collecting data without consent from children under 13, and accessing phone data, services and hardware without clear explanation why" (Crutchlow).

## Unlocking blockchain expectations

When new and powerful technologies are developed they tend to reflect the interests and values of those who develop them, whilst impacting many people's everyday lives. To counter this tendency, Furtherfield has sought to cultivate a critically informed diversity in the conversations and practices surrounding the blockchain development space, since 2015. The blockchain, the underpinning protocol of Bitcoin, cryptocurrencies and smart contracts, is 10 years old and is surrounded with a hype hardly seen since the arrival of the Web. Just as it has been necessary for artists to move into all forms of technology to disrupt the top-down narrative imposed, today's thinkers, hackers, and artists need to engage critically with the blockchain in order to translate, speculate and intervene in the impacts of its global roll-out.

Through a film, exhibitions, commissions, and publications, artists and researchers introduce circumspection, hazard warnings and a search for new solidarities into the narrative of the blockchain, otherwise, characterized by an accelerated logic of capital unleashed. The World Economic Forum predicts that these developments will be accompanied by a significant increase in global inequality. This vision of the future disenfranchises and demotes the role played by an ever-increasing number of humans (and no doubt other life forms too) in the business of determining what makes a good life. It has been shown that 'strategies for economic, technical and social innovation that fixate on establishing ever more efficient and productive systems of control and growth, deployed by fewer, more centralized agents [are] both unjust and environmentally unsustainable.

Rachel O'Dwyer, a researcher into the environmental and artistic impacts of blockchains points to the importance of an interdisciplinary engagement in the evolution of new techno-social systems.

> *We need to find ways to embrace not only technical solutions, but also people who have experience in community organizing and methods that foster trust, negotiate hierarchies, and embrace difference. Because there is no magic app for platform cooperativism. And there never will be. (O'Dwyer)*

Some promising examples in this area include *Resonate.is* is a blockchain based stream to own music cooperative that allows creators, labels and music lovers alike a share in the profits generated, as opposed to the current model, which consolidates control in the hands of a very small number of corporations. Tactical blockchain artwork *Bail Bloc* piggy-backs on the liberatory rhetoric associated with decentralisation in the blockchain scene in order to amplify a political message. Launched in 1999 the SETI project at the University of California, Berkeley crowdsources computing power to analyze radio frequencies emanating from space in the search for extraterrestrial life. (SETI) *Bail Bloc* by Dark Inquiry takes the form of a downloadable cryptocurrency mining application, that uses latent computing power to generate funding for bail. They enlist "a critical mass of users to challenge the role that bail plays in incarcerating low income black and brown people." (*Bail Bloc*) Dark Inquiry describe themselves as "an alliance of technologists, artists, writers, and investigative journalists convened to deploy a series of situated, confrontational, rhetorically-deliberate experiments that expose the anti-human logic of dominant technological power, and demonstrate the possibilities beyond it." *(Bail Bloc) Harvest* by Julian Oliver, uses renewable energy to mine cryptocurrency to fund climate change research, using a cryptocurrency called Zcash, donating "the proceeds of his installation's mining efforts to a group of nonprofits focused on researching and raising awareness about climate change." He is now scaling up and designing "a small mining farm fed by a 10kW turbine that will reliably earn between 12X and 30X more" than the initial single-turbine installation. He estimated that this expanded setup could sustainably fund a small NGO on its own. (Schneider)

On reading "Blockchain Geometries", by Rob Myers, written for Furtherfield, we identify a challenge for those attempting to engage with ethical questions and to compare the ethical standing of one blockchain against another. It becomes necessary to engage closely with the technicity of the protocol. Here he compares the Decred cryptocurrency with an unnamed alternative that we might assume to be FairCoin.

> *Deciding how to scale is a matter of governance. The Decred cryptocurrency has put governance front and centre. As well as moving to a hybrid Proof of Work / Proof of Stake system it has implemented an "on-chain-governance" system. Decred contains the forum for its own critique and transformation, implemented as an extension of the staking and voting system used by its Proof of Stake system. On-chain governance is controversial but addresses calls to improve the governance of cryptocurrency projects without falling prey to the off-chain voluntarism that can result from a failure to understand how the technomic and social forms of cryptocurrencies relate in finely-tuned balance. (Myers)*

Myers points to the dangers of coming quickly to judgements about the potential social and political impacts of different projects without an understanding of the nature of the technical systems at work. You can't confront capitalism and forces of neoliberalism without grappling with it (Massumi). If we are to survive and not fall into ill-informed states of perpetual denial, we need to collectively build new ways of developing peer to peer knowledge and then areas and interventions that occupy these territories for each of us

and ourselves, and not be left outside of these structures where we cannot change them.

## Conclusion

This study proves the existence of a dynamic, thriving, grounded culture, finding new and different ways of existing and creating, in contrast to the dominant neoliberal narrative. Yet, the power to create our alternative contexts is constantly under threat, by those who would lock down: territories, systems, places, spaces, histories, and consciousness, for their own less egalitarian interests. Humanity and arts across the board, needs new strategies for social and material renewal to develop more diverse and lively ecologies of ideas, occupations, and values.

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# ARTISTS IN THE CREATIVE ECONOMY: INOPERATIVE MODES OF RESISTANCE

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# Introduction

In the contemporary creative economy, myths of the autonomy and freedom of artists have become a condition of self-exploitation, self-precarization and self-branding within neoliberal forms of governmentality, as discussed by scholars including Gerald Raunig on the work of Isabell Lorey (200). What I call a 'post-crisis creative economy' is one that is in ruins following the economic crash of 2008, which resulted in a scaling back of resources for the arts in Europe and the UK. Suggesting ruins also presents an opportunity to rebuild, reconfigure and reimagine the cultural economy (Dillon). The 'post-crisis creative economy' is one that is characterized by the emergence of cognitive capitalism, the conditions of which present increased flexibilization of the labor market (Boutang). The result is that artists are pushed to become self-realized entrepreneurs, who pursue their creative work out of passion. Silvio Lorusso uses the term 'entreprecariat' to describe the precarious conditions of entrepreneurs who are left to bear the risks of running their own business. Artists-entrepreneurs today also play a role in the processes of gentrification in cities, where they are later pushed out of the area by rising rents and property speculators. As artists become central to the global creative economy, they are left disempowered and precarious at the throes of the market. The notion of the artist as a figure of an independent, self-determined individual, becomes one that is left to bare the risks in a highly competitive deregulated marketplace. In light of this, we ask, how can artists critically and effectively engage in today's globalized neoliberal cultural economy to regain agency as creative actors in society?

In this paper, I will firstly outline a brief trajectory in the evolution of artists and their roles in social transformation, critique and innovation alongside the rise of the culture industry. I will then detail the ways in which market forces consume modes of critique rendering them impotent. The second part of the paper explores the different relationships to the market artists can take as critical strategies that can be explored creatively. The last section suggests an overall reordering of the relations between art, technology and the economy, opening up to perspectives in China as an emerging cultural and economic force. The relations produced in the West are at risk of being repeated. However, the social and political context in China provides a different narrative and sites for struggle, where resistance is not possible in the same way. It also opens up to new possibilities for a truly transformative cultural economy that does not follow the logics of neoliberal democracies.

# Art and social critique

Artists have often existed on the margins in the Romantic tradition in the 18th and early 19thCentury, which celebrates artists as the individual genius and as subjects that strive for creative autonomy from routines of industrialized labor (McIntyre). Hans Abbing in his book, *Why Are Artists Poor?* details the impoverished conditions of artists that began largely in the 19th and 20th Century, where artists became more autonomous as they move away from dependencies on aristocratic wealth. During this time, there is also a growth in the number of artists without regulations like in other professions and with guilds, where anyone could feasibly become an artist (Abbing 127). Following countercultural movements of the 60s globally and the uprisings of 1968 in Paris, artists became associated with resistance movements and social change. Though within

western art history, the link can be traced back to Futurism, Dadaism and beyond (Mesch). Artists become entwined with leftist aesthetics of resistance that has evolved into forms of grassroots, DIY political-ethical subcultures and which can be found across art, music, fashion and technology.

The 1960s also saw the rise of Pop Art and the culture industry and art begins to converge with entertainment and mass consumer culture in which countercultural trends become appropriated (Adorno). Artists become cultural producers and 'content creators' as the 'long tail' becomes an economic model of the digital age (Anderson). The top one percent of artists on the art market are valued exponentially more than the ninety-nine percent. The majority of artists rely on their abilities to be entrepreneurial and to market and promote themselves online. The creative economy is celebrated as a progression for advanced economies in contrast to manual industrialized labor. In careers where one is free to be creative and pursue one's passions, knowledge work is considered desirable. However, it has also led to new forms of exploitation via low and unpaid labor, short-term contracts and precarious work conditions. As the self-realized entrepreneur becomes the ideal worker in the Post-Fordist economy, the 'independent artist' becomes 'the precariat'. The self-fashioning and self-determined individual in the economy becomes the creative proletariat and the oppressed subject within neoliberal democracies. Freedom to be creative and the aestheticization of the political, despite a desire to operate beyond the terms of the market, now only perpetuates it (Rebentisch). The incorporation of critique by capitalism has been detailed in the early work of Luc Boltanski and Eve Chiapello in the *The New Spirit Of Capitalism*, from 2006, which in many ways still holds relevance today.

## Inoperative modes of resistance

In the 'post-crisis creative economy' artists operating in modes of cultural organization based on social critique, transgression and radicalism either become incorporated into the market or remain on the fringes barely subsisting and largely disempowered. Considering the rising cost of living in urban centers, to remain staunchly independent and anti-market can also suggest one's privilege, where artists in urban centers often are the ones who come for well-to-do families who can afford time to pursue art and relish radical thought (as an example, the term 'champagne socialist' reflects the contradictions of the liberal elite). Globalization has created a new proletarian creative class in cities, yet it has also alienated those outside of the cities in former industrialized towns that have emerged as the 'alt-right', resulting in the current culture wars. Radicalism and modes of resistance begins to take new meaning, as it is no longer solely associated with a revolutionary leftist working class tradition.

Simultaneously, the modes of resistance often associated with the left have also become coopted by the far-right, rendering them impotent (Berardi). As culture becomes central to the global economy (since the 1990s), we see the institutionalization of critique and the co-optation of the aesthetics of resistance. The aesthetic modes of organizing normally associated with leftist politics are glorified in advertising and branding initiatives (see Andrea Phillips's *The Revolution Brought to You By Nike* from 2017). The example here is fiction but there are also countless real-world examples, such as Pepsi's use of protests featuring Kendall Jenner (Wong). The language and aesthetics

of resistance are employed as branding strategy that renders them to mere spectacle. They become inoperative in their intentions to produce change and are appropriated to sell commodities in a projection of a certain lifestyle as affective advertising. The failures of the Occupy Movement are amplified as the aesthetics of protest becomes coopted by the economies that it sought to challenge.

Additionally, music subcultures and underground scenes often associated with radical political views are celebrated in magazines such as *Vice* and *I-D* magazine that promote youth culture and transgressive lifestyles as branding for advertisers (Thornton). The cultures of 'cool' that we promoted with 'Cool Britannia' become a neoliberal trend-chasing cycle that continually coopts grassroots cultural movements into the mainstream. Notions of 'cool' can be traced back to the beatniks and the Beat Generation of the 1950s and beyond through art and music cultures. Media promoting cool and progressive culture have been revealed to be rather regressive through allegations of sexual harassment and exploitation of content creators (Steel; Nolan). It has become evident today that subcultures are not intrinsically ideologically left, but also included those who are now associated with the far-right (Houpt).

In th art world, the aesthetics of resistance including radical protest movements and transgressive activist subcultures are also fetishized: for instance in the presentation of Occupy at Documenta 13 and the Berlin Biennale 7,[1] and exhibitions like *Disobedient Objects* (at the Victoria and Albert Museum, London, in 2014) featuring videos, objects and ephemera from historical political movements.[2] These efforts take political movements out of their context and aestheticize them for an audience. Any action becomes inoperative in its intention to instigate change when placed within an art institutional context. The gestures to occupy a museum when it is permitted as art, no longer holds the political power of a staged illegal occupation within a space. Though art and aesthetics can potentially provide a transformative experience to alter one's perception of the world, the effects of direct action, collective organization against a political system and risks of arrest are removed. The political movements become an experience and performance that takes away confrontation with the issues at hand and are rendered impotent of their politics when presented as high art.

The art world is fraught with contradictions where the more radical or progressive works gain value and recognition despite reinforcing the institutions that they may seek to undermine (see Charlie Brooker's *Black Mirror* episode "Fifteen Million Merits"). It becomes evident in practices stemming back to institutional critique, where critique becomes institutionalized (Fraser 278), and as described by Marina Vishmidt it becomes as a 'homeostatic' process in which critique maintains and supports existing systems of power in which it self-adapts to challenges to it (263). Suhail Malik argues that contemporary art is caught in a bind after Duchamp, in which art continually tries to challenge the notion of art itself and yet continues to perpetuate it, unable to provide an exit from it:

> *as re-iterations of the logic of escape, these efforts also perpetuate and entrench the very limitations of art they seek to overcome. The resulting interminable endgame of art's critical maneuvers serves after a short moment to provide new paradigmatic exemplars for it, a condition of tamed instability that characterizes contemporary art today… (Malik).*

Art, culture, and politics converge in the post-crisis creative economy, where transgression maintains a neoliberal cycle in an on-going appropriation with no way out.

Moreover, and to a greater effect, online tactics normally associated with the left have been appropriated by the alt-right neo-nationalist movements. This shows how these technologies and tactics employed by artists and activists can be used for both social change and destruction, or in the words of Bernard Stiegler a *pharmakon* as both a remedy and poison. Right-wing groups can equally employ the tactics of hacktivist for racial profiling and online abuse, which has been made apparent by writers like Angela Nagle. The attacks from the far-right introduce a stark self-awareness of our biases and ideologies. This requires being sensitive to positions as educated, liberal populations living in urban centers, and to remind us of the tensions and conflicts created by those left out by globalization. Does the appropriation of modes of resistance and countercultural tactics by the far right and the market render them impotent, as they appropriate the means (memes) of production (Goerzen)? Do we abandon these modes of organization to find new ones? Is re-re-appropriation in an on-going culture war the answer?

DIY hacker culture also undergoes a transformation and assimilation into the neoliberal paradigm as maker culture, fab labs and accelerators.Richard Barbrook and Andy Cameron discuss the 'Californian Ideology' where radical libertarian counterculture together with neoliberal free market ideals provided the foundation for the emergence of Silicon Valley as a dominant economic force (Cameron 12-17). Technological innovation constantly searches to 'disrupt' and revolutionize the industry without ever challenging its underlying logics. Sebastian Olma refers to Naomi Klein when he talks of "technologies of changeless change", when we are trapped in simulations of progress as innovation continues to perpetuate inequalities of wealth and power. Notions of sharing, collaboration and horizontal organization are valued and incorporated into corporate structures. The works of Simon Denny, in his exhibition "Products for Organizing" at Serpentine Gallery in 2016, illustrates the history of hacker culture and its evolution to corporate structures through models and processes of Holocracy[3] and Agile[4] management. The anti-authoritarian values of countercultures of hackers become coopted as protocols for productivity and control within corporate environments. The sense of freedom over one's work also provides a situation in which teams are self-organized yet still under the legal framework and financial control of a corporate entity.

Other examples of the appropriation of collaborative culture include the widely celebrated and critiqued 'sharing economy' such as Airbnb, which claims to take power away from large hotel groups to create a 'peer-to-peer' economy. However, despite good intentions, it presents a model that is not truly peer-to-peer when mediated by a centralized platform that skims a percentage off the top of every transaction. The amount of money funneled into Silicon Valley globally creates a more centralized power. In the 'Californian Ideology', internet and social media initially celebrated for its civic and revolutionary potential, no longer stands as a tool of liberation. Both the cyclical nature of artistic critique and techno-creativity that seeks constant innovation creates a homeostatic loop with no means to escape. It becomes urgent for artists to critically interrogate the economies in which they operate, without becoming complicit or subsumed by it.

# Dispositions to the market

Artists on the left require a new strategy when considering their positions on the fringes becomes one of disempowerment through conditions of precarity and instrumentalization by the market. Infrastructures of a social system create power relations in which we are embedded. There is a need to reconsider the infrastructures, as well as the roles and narratives surrounding artists and creativity in society.Artists can take a multiplicity of relations to the market in which they can actively or passively engage or disengage with it. Disposition as discussed by Keller Easterling is a "relationship or relative position… as the unfolding relationship between potentials, resists science and codification in favor of art or practice." (251) Disposition is a set of potentials and relations that are possible within different situations. Easterling refers to dispositions primarily in context of urban architectures, however, it can also be approached through socialtechnical systems and modes of organization within the creative economy. For Easterling, "Altering perceptions, attentions, and habits of mind in this relationship may be as powerful as altering the geometric and volumetric space of the city. Any of these adjustments can re-center attentions, unseat powers, or redistribute economies." (251) To move between these codified relations is to also open up to a creative practice in relationship to the market in a mode of play to explore infinite possibilities. Below is a scale of some of the relations to the market artists can take, from total 'withdrawal' on one extreme to 'acceleration' on the other. This is my own interpretation of the current state of the cultural economy that also opens up to explore 'disposition' as a latent potential to experiment with the possibilities in-between. Artists employ different strategies in relationship to the market at different points in their career. This scale helps provide a broader understanding of the possibilities for artists to suggest how they can regain agency through their disposition to the market and society.

**Engagement with Market <—> Disengagement from Market**
Accelerate | Innovate | Hack | Exploit | Participate | Adapt | Resist | Cope | Withdraw

**Figure 1: Market Relations Scale – Artist's relationship to the market.**

*To withdraw* from the market is to quit art all together, for instance likenMarcel Duchamp who famously left the art world to play chess. To exist beyond the market could also mean to remain on the fringes as an outsider artist or hobbyist.

*To cope* is to employ strategies including therapies and meditation as a means of dealing with contemporary life. This strategy can be seen in artworks exploring themes of dealing with anxiety and mental health. An example could be works employing Autonomous Sensory Meridian Response (ASMR) such as Claire Tolen and therapeutic Virtual Reality (VR) experiences such as those featured in the Big Anxiety Festival in Australia. These works provide relief and a way of dealing with the conditions of capitalism.

*To resist* is to protest and lobby for fairer labor conditions for artists. There are several groups including Working Artists and The Greater Economy (W.A.G.E) in the US and Precarious Workers Brigade and the Carrot Workers Collective in the UK who protest against unpaid internships, low and no pay for artists and exploitation of creative workers.

*To adapt* is to find other kinds of work to support one's living as a means to maintain integrity of one's artwork that is free from the market. Most artists will operate in this realm

by teaching for instance, to sustain their art practice.

*To participate* is to create works that are sellable as commercial artists who actively promotes themselves and seeks gallery representation.

*To exploit* the market is a strategy employed by artists such as Andy Warhol, Shepard Fairey (Obey Giant), Xu Zhen (MadeIn Gallery) who turn their artistic production into brands and mass produced commodities. Many of these artists will already have an established career and are able to sell their works to a wider audience. Artists can market and produce works that are easily sellable as products exploiting many distribution channels.

*To hack* or subvert the market is to create interventions or alternative economies. Paolo Cirio is an example of an artist who hacks the market by creating his own model in his Art Commodities project. In this project he creates an alternative model for the art market in which socially engaged projects gain value the more they are shared. Works are low cost so that anyone can participate. The project is underpinned using blockchain and smart contracts that ensure the artist is remunerated. His project subverts the systems of value within the art market, to make it accessible to anyone rather than the elite few.

*To innovate* is to create new business models and innovative start-ups for art. Jeremy Bailey's *LEAN Artist Project* is an example in which he creates an accelerator for artists. Using the language and formats of start-ups he invites artists to participate in boot-camps in which artists are asked to come up with a start-up as art project with support of mentors to ultimately pitch their idea to investors. The projects are intended to be functioning social businesses that can also support the artist's practice.

*To accelerate* is to take innovation and marketization to the extreme, and to approach a post-work society in which artists would be free to create beyond the market. This includes developments with artificial intelligence and imagining a world in which machines take over our jobs supported instead by a Universal Basic Income, freeing us to be creative beyond economic concerns (Srnicek and Williams).

This model is not intended to be definitive but to help guide an understanding of the different strategies of artists in relation to the market. The potential is to operate in-between in ways that do not follow existing models and ideological positions to the market. To consider one's disposition to the market opens up for new possibilities beyond dogma in a situation where there appears no way out. How can artists critically and creatively engage with the market to instigate change from within and beyond existing roles and ideologies? Overall, the individual may be limited against large economic powers and this requires a larger structural re-ordering which another social, political and cultural context and narrative may provide.

## Reality check: Creative economy as cultural hegemony

The contemporary conditions and struggles within the culture industry in the West is one that presents itself as universal. However, it is one that is specific to 'advanced' economies suggesting a linear progression from an industrial to a post-industrial economy as the only way for social and economic progress. This trajectory is imposed globally as a hierarchy of development for emerging economies to follow. To exit from this dominating

discourse and conditions of oppression is to situate oneself within another context and political and economic timeline.

When considering the context of China, it presents an opportunity to re-think notions of resistance and cultural development. The creative economy has become a globalizing force that drives modernization in developing countries where it becomes a form of cultural hegemony as gentrification promotes a particular lifestyle and urban aesthetic. It is projected as an aspirational model, as Hong Kong and China rapidly develops its creative economy with new museums and cultural districts with cafes and restaurants and implied liberal cultural values.


**Figure 2: Photo taken by the author of the interior decoration of a restaurant in Hong Kong featuring icons from US and UK popular culture, a fake fixed gear bicycle and 'free Wi-Fi' without any actual Wi-Fi available; an example of cultural hegemony and gentrification.**

However, China remains largely oblivious to the culture wars in the West as the internet remains tightly controlled by the Communist Party, who filters out any dissenting voices. It makes the powers of Chinese state censorship seem impressive when even video bloggers are 'disciplined' for use of vulgar language online in the government's attempts to 'beautify' the internet (BBC News). Freedom celebrated as part of the libertarian ideals of the early internet is taken for granted in the West, but has also led to destructive cultural clashes and online abuses. At the same time, market freedom in the West has allowed for companies like Facebook and Google to monopolize and control all data and information in support of plans for mass surveillance and predictive advertising. Control takes another form in democratic societies, placing power in the hands of corporations. In China, modes of resistance must take another form where change can only be instigated in collaboration with the government.

China has an authoritarian government, yet the Chinese Communist Party understands the necessity for freedom, and loosens regulations to allow for innovation within informal economies to emerge; particularly in Shenzhen as one of the 'Special Economic Zones' (Lindtner, Greenspan and Li). Experiments with capitalism are then incorporated into national policies, however never undermining the socialist regime (Wang and Li). There is tension between chaos and control in an environment that allows for a more agile economy with lax labor and copyright laws. In a state of growth, the country allows for creative and economic liberties though always under close watch of the government, and there are constant risks of over-stepping the line. Internal friendships with the state become integral to getting things done and for achieving economic goals. China presents an opportunity to provide an alternative to Western democratic capitalism, which has now found itself in a state of destruction with the culture wars, and in a homeostatic loop of neoliberal innovation. Though authoritarianism is clearly not the answer, China offers a re-framing and potential to consider another narrative for artists and their roles in society.

While the economic crisis had an impact on the Asian economies as the demand for exported commodities declined, it did not affect the emerging creative economy, and rather encouraged Hong Kong to move away

from its dependency on finance. Because of lower employment, people sought out cheap entertainment through online media and games, and as a result the creative economy grew in China following the economic crisis. Therefore the Asian economy puts efforts into developing creative content that pushes forward the creative economies in the region (Wuwei).

Precarity is, as discussed above, a condition of post-industrial developed economies. China's economy is still largely industrialized, though there is a shift towards a knowledge economy as a path carved out by the West. Cultural work is for those who are educated and can afford to pursue creative careers. In China, notions of precarity exist, but more in terms of rural migrant workers moving into cities in vast numbers often to work in factories in hopes to raise their family out of poverty. For a Chinese family, creative work is often considered non-lucrative and impractical. It first and foremost one's indebtedness and responsibility to one's family through 'filial piety' that will often place financial security before pursuing unstable creative work. The notion of 'saving face' often becomes more important when considering a career in art. Issues of precarity within the knowledge economy still exist in globalized urban centers like Shanghai, Shenzhen and Hong Kong. The gap in wealth and education between rural villages and advanced urban centers in China are unparalleled as inequalities are magnified. President Xi Jinping takes capitalism as a subsidiary to the socialist regime where it is managed and controlled by the Party, providing the necessary checks and balances to the market. However, the ultimate power of the state is also taken to the extreme where discipline, surveillance and control by the state have no limits.

The culture in China remains highly conservative and strongly patriarchal. For instance, it does not recognize gay marriage and oppresses minority populations particularly in Nepal and Western China. Many of the values and guiding principals from the Confucian and Taoist tradition help to maintain harmonious order in society. Philosopher Yuk Hui in his book, *The Question Concerning Technology in China* encourages China to develop its own technological and cultural model grounded in its own histories and technological relations embedded within Chinese philosophy. He suggests that every culture and country should explore its own history to create a plurality of relations with technology, which do not follow Western models of modernity. This challenges globalization and modernization (as well as the culture industry) as the economic model that has become a universalizing force and narrative. How to reconnect and redefine technical relations in China and internationally remains a broader challenge and long-term project to work towards.

Overall, the situation in Europe and America after the economic crisis in 2008 is largely a conflict caught in a neoliberal cannibalistic cycle and culture war. The current situation instigates a sense of fear, anxiety and uncertainty, and a lack of vision for the future. Artists on the left are powerless as their positions are subsumed by the market and coopted by the far-right. To regain agency artists can consider their relationship to the market as part of their creative practice itself. It opens up for possibilities to experiment and explore the extremes of engagement with the market, and also to find the spaces in-between that may open up new possibilities. The context in the West is often presented as universal; yet it potentially blind us from the possibilities of another path. The context in China offers its own version of capitalism with Chinese characteristics (though not without its own pitfalls). It offers another political and cultural context that opens up to considerations and possible relations with

technology grounded within Chinese history and philosophy. In a state of growth, China is optimistic towards the future, actively experimenting with the possibilities of the market, but also with the power to implement appropriate checks and balances under ultimate state power. Though rapid development has led to ecological disaster, which is a global concern, a centralized government also has the power to make the necessary broad sweeping changes. The failures of neoliberal democracies become apparent with the rise of the alt-right and the monopolization of the internet by large corporates such as Google and Facebook. In China, art and culture is tied to industry as a model for economic development with a large presence of art in shopping malls, however, creating a model for art sustained by commerce and without contradiction. Though this model may not be ideal, can we find ways to reconnect art and technology's role in society beyond notions of progress, modernization and economic maximization? What new models for culture can we imagine where artists can truly play a crucial role in shaping the future of the world and economy without being complicit, instrumentalized or subsumed by it?

# Notes

[1] Sebastian Loewe's paper details the difference when the Occupy movement is presented within an art context such as in Documenta or the Berlin Biennale. The act of resistance is no longer present since there is no resistance against the institution of art and the aesthetics of protest become spectacle or a 'human zoo' presented as an artwork framed as a Joseph Beuy's social sculpture. These presentations of Occupy in art exhibitions did not add to the movement or aid its political demands, but rather rendered them impotent. The context of art becomes an ineffective platform for instigating any political change beyond awareness or aesthetic pleasure.

[2] The exhibition features objects from different historical protests and social movements as symbols of the practices of resistance. Posters, banners, graffiti and loudspeakers feature widely as the aesthetics of protest take precedence over the issues and results of their struggles.

[3] Holocracy is a method of non-hierarchical management created by entrepreneur Brian Robertson that encourages peer-to-peer collaboration and a system for democratic consensus decision-making. However, in the case of the company Zappos, which adopted this method, it was revealed to be extremely hierarchical, bureaucratic and restrictive form of management (Denning). This reflects the appropriation of values into corporate management structures that appear ideal on the surface, but rather reinforce existing power structures.

[4] Agile management is a popular form of self-organizing of teams in a flexible, collaborative and reflexive manner for software development and design projects. It ensures problems are dealt with as they arise in an iterative process. It is a means for managing creativity that end up being more of a management trend to appeal to employees and ensure productivity of workers. Simon Denny's exhibition draws links from the evolution of hacker culture to its incorporation into the corporate structures of Silicon Valley.

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# INFLATABLES AND ACTIVISM: AFFECTIVE POLITICS AND THE POLITICAL POTENTIAL OF INFLATABLES

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*If something is to be done with 'creativity' today, it must first of all escape from the protocols of capitalist control. (Holmes 36)*


**Figure 1: "Welcome to Hell" protest during the G20 summit 2017 in Hamburg. Source: Rasande Tyskar, CC BY-NC 2.0, https://flic.kr/p/VvPGe8.**

On the eve of the G20 summit that took place on the 7th and 8th July 2017 in Hamburg, the "Welcome to Hell" demonstration ended just under an hour later with a much-criticized police action. The ensuing riots quickly captured the media coverage, and although the police action was almost unanimously rejected, it was familiar pictures of hooded people and burning cars that started circulating in the web. But the protest had begun peacefully and a very different picture could have shaped the perception of the 'black block': a giant inflatable black cube that was being carried by the protesters above their heads (see figure 1). It was the same cube that had already been used a few days earlier at the peaceful demonstration "G20 Protestwelle" ("G20 Wave of Protest"), where it floated along the Elbe next to colorful boats and banners.[1]

This image captured my thoughts and I realized that the cube was not the only inflatable that was used during the protests.[2] The first question coming to my mind was: why do they use Inflatables instead of e.g. banners? The obvious answer is: it is more interesting, it creates different images, it stays in mind. The following thoughts on the potential of inflatables for political protests then led to this essay.

## The summit

During the G20 summit Hamburg was a 'zone of exception' – not only within the officially declared zone around the Hamburg Messe where the summit took place – with over 30,000 police officers out in force. But the massive security measures and concomitant restrictions on demonstrations are above all the organizational side of a problem that begins at another level. Some months before the summit the daily newspaper of Hamburg (*Hamburger Morgenpost*) published an article that stated "G20 summit in Hamburg: What's ahead of us?"[3] The cover picture showed a scene of the protests against the G20 summit 2010 in Toronto. The first obvious characteristic of this form of reporting is the use of an undifferentiated "we", which requires an identification of the reader with an unspecified group. Secondly, the image draws a direct link between 'violent' protests of the past and coming protests. So a certain course of action is assumed which in this case also includes the supposedly typical features of the autonomous/radical left (e.g. burning cars, hooded men).

Brian Massumi amongst others has differentiated the political use of images like those from statistical or predictive politics and coined the term "preemptive politics". His main assumption is that preemption is the most powerful operative logic of the present. While he mainly refers to war tactics and especially the politics of George W. Bush, we can expand this logic to other parts of politics, since the main point is that an unspecified threat or enemy that has

to be fought against is first of all created: "The most effective way to fight an unspecified threat is to actively contributing to *producing* it." (Massumi, *Ontopower* 12)

When we link that with the dynamics of image circulation through (social) media – in this case pictures of the protests against the G20 summit – this tactic leads to what Nikos Papastergiadis calls "ambient fear". This implies the perception that one is surrounded by various threats without any differentiation, its background, its dimensions, etc. The form of speculative reporting as for example in the case of the Hamburger Morgenpost, links leftist protests to the mechanisms of ambient fear within the operative logic of preemptive politics. The result is the assumption, which is at the same time reproduced and circulated, that the autonomous left and therefore their protests are always already a threat. And the reporting on the G20 summit in Hamburg showed clearly: it is a self-confirming circle. The images, which were circulated during and after the summit and the protests against it, correspond exactly to the expectation that was built in advance: burning barricades, hooded men, chaos and violence. There was all this chaos of course, but it was just a small part as the vast majority of the protests were colourful and peaceful.

The protests against the G20 summit in Hamburg are just one example among many. The problem is not location or situation specific, but is affective. The question coming to the fore is then: how can this circle be interrupted? What kind of forms of protests are needed that can deal with the danger of critique often becoming a stabilizing moment for the ruling system?[4] Where is the potential for 'new lines of alliance' which enable collective production and collective subjectivities as Félix Guattari and Antonio Negri put it (Guattari/Negri 2010)? It is not a question of a new utopian revolution, but of a form of openness in which the differences and contradictions of a movement are not overcome, but also do not lead to that impotent, speechless passivity that the left-wing intellectuals have been so long and repeatedly accused of.[5] When it is about engaging with this kind of paradox, creativity is needed.

## Aesthetic forms of resistance

> *Capitalism knows how to profit from every opportunity. (Stengers 11)*

When it comes to connecting creative approaches to resistance and activism or arts and political action there are different strategies and discourses that arise. One example is to move beyond the field of arts, engaging with the neighbourhood, providing tools and practices for a better life as in works of 'dialogic art' or 'conversational art' and where art is supposed to express an "utopian drive to imagine a more ideal form of social life" (Kester 8). Claire Bishop amongst others has criticized this approach as it takes participation to be synonymous with collectivity and supposes those projects therefore to be inherently opposed to capitalism. She stresses on the contrary that exactly those kinds of art projects tend to go perfectly with neoliberal dynamics: "In insisting upon consensual dialogue, sensitivity to difference risks becoming a new kind of repressive norm – one in which artistic strategies of disruption, intervention or over-identification are immediately ruled out as unethical" (25), and that this consensus-based approach will rather help to find a way to deal with the existing structural conditions than to challenge them. And those approaches usually act on the assumption that there is a direct

link between representation and mobilization which risks to turn participation into an end in itself. But just because a critical artwork shows me how bad the world is, I don't start to save it tomorrow, do you?

There is a similar problem with the notion of mobilization. As Isabelle Stengers and Philippe Pignarre emphasize, mobilization is the opposite of learning. And if we take mobilization as primordial, "every failure can be explained by the failure of the masses to mobilize, or because we didn't succeed in mobilizing the masses" (20).

So perhaps we should stop looking for a solution, for a mobilizing moment in the arts and start appreciating the daring contradictions that we are confronted with. Or as Jacques Ranciére puts it: "to prevent the resistance of art from fading into its contrary, it must be upheld as the unresolved tension between two resistances." (191)

## Inflatables

Inflatables do not organize, inflatables do not mobilize, inflatables do not have a political programme. The inflatable black cube that was used during the G20 protests did something else. It established an interesting connection to the expected, stereotypical images of burning barricades. The connection to the expected occurrences is the visual commentary on the black block which is, in the logic of the media coverage and political measures (as explained above), directly linked to the mentioned phenomena. In public perception the black block is therefore usually associated with chaos, danger and violence. The inflatable black cube counteracts this perception on several levels, but especially the combination of water and the inflatable creates completely different, more playful associations (for example inflatable water toys).

The use of inflatables[6] in political protests isn't limited to this example. Since its foundation in 2012 the group *Tools for Action* has implemented various projects that combine inflatables and protest.[7] The founder of the group Artúr van Balen also emphasizes the playfulness inflatables bring to demonstrations and assigns their use to what he calls "tactical frivolity".[8]

The question we have to turn to now is whether inflatables can be an adequate tool to face the problems of affective politics. What are the potentials of the protest form tactical frivolity? And finally, why are gatherings in the street (or on the water) still important, considering that firstly it is often about global phenomena and secondly that we are embedded in digital infrastructures? Some like Keller Easterling therefore claim that exactly those gatherings are ineffective: "Activists who show up at the barricade, the border crossing, or the battleground with familiar political scripts sometimes find that the real fight or the stealthier forms of violence are happening somewhere else." (213)

In the following, the history of the use of inflatables as a form of protest is briefly outlined, in order to classify them theoretically and to give an estimate of their potential as well as problems, based on a few examples.

In 1966 the group *Utopie* was founded in Paris. The members were a mix of architects, landscape architects, sociologists (the most famous member probably was Jean Baudrillard) and artists. One reason for the formation of the group was the prevailing zeitgeist of the 1960s, that art and life could no longer be regarded as separate, as was expressed in numerous avant-garde trends (Dessauce 13). Furthermore, there existed a growing dissatisfaction with alienating modern architecture and city planning, which they encountered with a radical critique in both theory and praxis, not least to connect these approaches. One of the main influences was

Henri Lefebvre who, as a critical Marxist, had been working intensively on the subjects of alienation, modernism and urbanism since the 1940s and whose concept of the"right to the city" is still today a major influence for city activists.[9] "Lefebvre's themes – the need for play, spontaneity, the realization of desires and calls to rescue utopian imagination from science fiction, to invest all of technology into daily life, to bring about 'daring gestures', 'structures of enchantment', to seek 'moments' of total consummation of possibilities – were coming to the fore in 1968." (Dessauce 21)

So it also was about not just rejecting the technologies of modernity, but finding new ways to use them, to experiment with them, to find alternative ways to use them for a better life. With this attitude, the group started to engage with inflatables. In 1968 they curated the exhibition "Structures Gonflables", where they expressed an interest "in inflatables as a challenge to the weight, permanence, expense, and immobility of traditional architecture" (Genevro 8). This also demonstrates the core of their critical approach: that the static, formalist and scientific architectural urbanism not only represented "aesthetic breakdown and boredom" for them, but also "bureaucratic control and repression in disguise" (Dessauce 20). Inflatables in many ways expressed the opposite: mobility, transience, liveliness, utopia. Art and architecture was supposed to no longer take place in one's own closed field, but to become a social practice. "Hence, beyond the fun and play, the inflatable ethos possessed a subversive constitution which recommended it to avant-garde practice, and to the discourses of urban alienation and ecology – two discourses which were the same but often irreconcilable, each caring for its own sanctuary of disobedience, in the wild or in the city." (Dessauce 14) So at last the group's approach was part of those art movements that later influenced the so called dialogic art (previously mentioned).

But while the 1968 movement mostly happened in the streets, the group's critique, expressed with inflatables, stayed within the traditional field of arts (e.g. exhibitions) that they actually wanted to overcome.

But the use of inflatables as a medium of critique is still interesting. While being used by the Utopia group as a critical commentary on modernity, they were at the same time the product of the very consumer society that was so widely rejected at that time. Plastic had been used for mass production since the 1940s and due to that had become increasingly popular, and had an impact on the design and production of everyday articles.[10] Inflatables themselves were known in the street scene mainly from US parades, such as the Macy's Thanksgiving Day Parade, while in the former Soviet Union, however, they were already used for protests in the 1930s.[11]


**Figure 2: Macy's Thanksgiving Day Parade in New York, 1979. Source: Jon Hader, CC-BY 2.5, http://bit.ly/2oUvoCo.**

Inflatable sculptures were thus both a symbol of a capitalist consumer society and communist revolutionary movements, they stood for technological progress and for an alternative utopian lifestyle.

What is most striking in this context is that the merging of the latter two aspects would some years later be the ideal of the 'Californian Ideology', which like little else

stands for the appropriation of countercultural approaches by hegemonic power. So the historical use of inflatables is part of the already stated problem of critique as a stabilizing factor for existing power structures. Finally, the question arises, whether it is possible to tackle this structural problem with inflatables themselves.

## Tactical frivolity and affect

> *We're in Berlin, where we find an agent involved in pitched battle with the inflatable. He pokes at it, keeps on poking, but it won't deflete. The protesters take advantage of the situation to make their escape. Finally the policeman gives up, as he can't overpower it… [12]*

The protests against the 1999 World Trade Organization Ministerial Conference (WTO Conference) in Seattle represent a turning point for protests against a globalized policy, marked above all by the neoliberal ideal. The question of what subversive art is and what it can achieve has been discussed and put into practice in many ways since the 1960s, and yet it is no longer about resisting existing (capitalist) power structures out of a fixed identity position (be it belonging to a class, to an institution, or to a nationality), but to create with existing means new fields of action within these structures. "It's about allowing the inherited forms of solidarity and struggle to morph, hybridize or even completely dissolve in the process of encountering and appropriating the new toolkits, conceptual frames and spatial imaginaries of the present." (Holmes, "Recapturing Subversion" 273)

This form of playful appropriation, subversive practices and peaceful resistance then found a global stage in 1999 with the protests in Seattle. Tactical frivolity spread as a form of protest and attracted more internationally organized protests of this kind such as the EuroMayDay parades. And we can say the numerous forms of peaceful protests against the G20 summit in Hamburg are inheritors of this approach as well. As Stengers and Pignarre put it: The Cry of Seattle is still heard.[13]

So is there reason for hope?

We should consider Massumi's notion of hope. He connects it not to optimism, but on the contrary separates it from that, since otherwise it would imply utopian thinking. Rather, he is concerned with the thinking of the present, with a "scope of possibility" that opens up "the opportunity for experiments and trial and error" (Massumi, *Ontomacht* 26).[14] He therefore connects hope with affect, which means in this case that it is not about the question of the success or failure of an action in any future, i.e. a step forward (be it theoretical or practical), but "to stay exactly where one is – only more intense." (Massumi, *Ontomacht* 27) This link between affect and intensity is central to Massumi's affect theory and can shed light on why inflatables and, more broadly, tactical frivolity as a form of protest are important means of responding to current political problems. For it is precisely the playfulness of these actions that creates a form of intensive encounter on the street, which is not possible with mere "running along". This can be seen for example in the May Day demonstration in Berlin, when some of the protestors suddenly start to play ball with the inflatable "cobblestone",[15] which, similar to the inflatable "black block", creates a reversed image of stereotypical associations with actions of the autonomous left. Another important point in Massumi's affect theory is that affect and emotion are not

equated and affect has a bodily dimension. By referring to Spinoza, he emphasizes the ability of the body to affect and to be affected, which always converge. This means that you are in permanent transformation: "The ability of a body to affect and to be affected – its affective charge – is nothing solid" (Massumi, *Ontomacht* 27). Moreover, this affective ability is always more than subjective, that is to say, it can be realized above all in collective actions.

Affective outbursts produce interruptions, to which the reaction is affective as well. And this reaction is always dependent on the situation of the body, i.e. one's physical involvement in the situation.

Especially Donna Haraway and Judith Butler have variously stressed the importance of the body in terms of knowledge and power structures. Haraway links this in her theory of "situated knowledges" with the question of potential collective action: "The knowing self is partial in all its guises, never finished, whole, simply there and original; it is always constructed and stitched together imperfectly, and *therefore* able to join with another, to see together without claiming to be another" (586). The body is not a completed entity and the self does not form a fixed identity, but they manifest themselves again and again in relation to their environment: the people, the technology, the infrastructures. So within demonstrations on streets or squares, it happens more than the expression of a particular demand or rejection. The gathering itself, the coming together of different bodies, expresses a demand before any stated claim, that is, for the possibility of gathering in public at all. The action thus simultaneously demands the enabling conditions of this action. We are always embedded in situations, in relation to and dependent on others – people, things, infrastructures, power structures, etc.) – and therefore always limited in our actions, while exactly these limits are at the same time the enabling conditions for those actions. "What I am suggesting is that it is not just that this or that body is bound up in a network of relations, but that the body, despite it's clear boundaries, or perhaps precisely by virtue of those very boundaries, is defined by the relations that make its own life possible" (Butler 16). This is why Butler uses the term 'supported action', which is very fruitful to think with. The occupation with the question of freedom or autonomy therefore always has to consider limits as well. And then freedom is not the utopia of boundlessness, but the game with just those boundaries.

And here it is worth remembering Ranciére: this game is not about dissolving or covering up the emerging paradoxes. We can rather think of it as a 'dissensual game'.

## The potential of inflatables for political actions

> *Art is not a mirror held up to reality*
> *but a hammer with which to shape it.*
> *(Bertolt Brecht)*

In 2010 a small suitcase was sent from Berlin to Mexico. It contained an inflatable hammer, that grew to twelve metres in length, once filled with air. The Eclectic Electric Collective who built the hammer wanted to contribute something to the protests against the policies of the United Nations Climate Conference that was held in Cancún without flying to Mexico themselves, where the conference was held, to avoid producing even more emissions.[16]

The hammer quickly became a symbol for the protests. It was carried along the path of the demonstration by the protestors. Due to its size this was only possible by means of collaboration of the protestors. And again due to its size this collaboration couldn't really be

**Figure 3: The inflatable Hammer at the protests in Cancún, Mexixo, 2010. Source: Armando Gomez, CC BY-NC-SA 3.0, https://bit.ly/2jl8929.**

coordinated with instructions, but had to be a coordinated movement of bodies.[17]

With the use of the inflatable hammer the relational dependency of the bodies became actual and the collective potential for action was exercised. The action can be seen as a successful implementation of Massumi's proposition: "When you look at politics from an affective point of view, it is the art of […] sending out intermittent signs and triggering the stimuli that bring the bodies into alignment while activating their abilities differently" (Massumi, *Ontomacht* 78). It is important to note the *different* activations, because this is the big and decisive difference to the mass mobilization practiced in the right-wing spectrum. In the latter, it is always about the identification of the individual with a collective, with a larger idea – which itself is usually very simple and fed mainly by fear and rejection against an undifferentiated other – i.e. the subordination of the individual under something greater. Activation is not equal to mobilization, it doesn't create a consensual mass. The activation that the inflatable hammer created was still open for coincidences. When we think with Massumi it becomes clear that situations are never completely determinable. "It will be while it happens" (Massumi, *Ontomacht* 78). In the case of the hammer the unexpected end of the journey occurred when the carriers tried to push it against and over the fence that surrounded the area where the conference took place. The policemen who watched the fence immediately started to attack the hammer and eventually destroyed it. With the brutality of their action against something that mainly consists of air and therefore poses a rather small threat, the police ridiculed themselves. On top of that they unwantedly gave the numerous present media the possibility to circulate images of this action. The ridiculousness of the action also comes from the fact that the police couldn't handle the paradox that was created by the protestors, so the only solution to dissolve the tension they found was violence, something usually ascribed to the protestors.

Maybe we can interpret this situation with Ranciére's notion of the artistic rupture that produces a split between the artistic production and the social destination, "between the significations that can be read on them and their possible effects" (147).

As both our bodies are constantly changing and updating and events have always more inherent potentials than the actual implementation, there is an openness that implies hope for an alternative process. "Simply changing a situation by reinforcing a previously unnoticed potential is such an alternative execution" (Massumi, *Ontomacht* 80).

The inflatables that the group Tools for Action use and provide have the ability to do that. Since the instructions for building an inflatable cobblestone are freely accessible

on the Internet,[18] they can be used for any situation. The situation is not created by the inflatable (as it usually is with dialogical artworks), but it is shaped and transformed by it. I would argue that inflatables have the potential to make use of the "emerging spatial order enabled by distributed electronic communication networks and the proliferation of wireless, mobile media in extremely 'densified' urban spaces" that Eric Kluitenberg sees being revealed by the so-called 'movement of the squares' ((Re-)Designing Affect Space).

When van Balen describes how a giant inflatable paving stone suddenly unleashes a kind of ball game between the police and the demonstrators in a demonstration in Berlin, dissolving existing tensions between these groups in a humorous situation that otherwise could have often turned into aggression, then you become the child of the event.

> *Becoming the child of an event: not being born again into innocence, but daring to inhabit the possible as such, without the adult precautions that make threats of the type 'what will people say?', 'who will they take us for?' or 'and you think that is enough?' prevail. The event creates its own 'now' to which the question of a certain 'acting as if', which is proper to children when they make things (up), responds. (Stengers and Pignarre 4)*

And that's why the inflatables are so interesting. They are totally unsuitable to mobilize a mass and quite suitable to activate a crowd.

# Notes

[1] https://flic.kr/p/VaagCb. Accessed 25.04.2018.

[2] See for example: https://flic.kr/p/V8cRmk. Accessed 25.04.2018.

[3] https://www.mopo.de/hamburg/g20/g20-gipfel-in-hamburg-was-kommt-da-auf-uns-zu–26273006. Accessed 20.02.2018.

[4] In this case, the images that were produced by the riots stabilize the very image that previously existed of left-wing protests, thereby giving critics the right to criticize them. In turn the critique that was actually posed (against the G20 summit and especially autocratic rulers like Putin, Trump or Erdogan) was pushed into the background and thus became ineffective.

[5] For example just recently: https://www.zeit.de/kultur/2018-04/intellektuelle-linke-schriftsteller-rechtspopulismus-schweigen-d18. Accessed 30.04.2018.

[6] With the term Inflatable I describe no specific form, but inflatable things in general. It is used as a generic term.

[7] http://www.toolsforaction.net/. Accessed 28.02.2018.

[8] See for example http://beautifultrouble.org/tactic/inflatables/. Accessed 28.02.2018.

[9] In Hamburg, for example, since 2009 there has been the network "Right to the City", which promotes affordable housing, non-commercial open spaces, the socialization of land, a new democratic urban planning and the preservation of public green spaces: http://rechtaufstadt.net/pb2017.html. Accessed 26.02.2018.

[10] Probably the most well-known example is Tupperware, which gained great popularity in the household sector in the 1950s with its Tupper parties.

[11] https://bit.ly/2KvubMa. Accessed 25.02.2018.

[12] The quote comes from the spanish news, reporting on the use of inflatables in a protest: https://vimeo.com/162656944. Accessed 01.03.2018.

[13] Isabelle Stengers and Philippe Pignarre start their book *Capitalist Sorcery* with the cry that was born in Seattle: 'another world is possible'. The striking question for them is how to inherit from this cry, that is the name of an event.

[14] The quotes from the German edition are translated by the author.

[15] https://vimeo.com/51358894. Accessed 28.02.2018.

[16] You can read the full documentation of *The El Martillo Project* online: http://www.minorcompositions.info/?p=357#more-357. Accessed 28.04.2018.

[17] This kind of embodied collaboration can be seen in this video: https://vimeo.com/82748623. Accessed 02.03.2018.

[18] http://www.toolsforaction.net/how-to-build/. Accessed 02.03.2018.

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# CHANGING VALUES

Calum Bowden

# FORKING IN TIME: BLOCKCHAINS AND A POLITICAL ECONOMY OF ABSOLUTE SUCCESSION

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> *Time is the most important thing in human life, for what is pleasure after the departure of time? And the most consolatory, since pain, when pain has passed, is nothing. Time is the wheel-rut in which we roll on toward eternity, conducting us to the incomprehensible. (Alexander von Humboldt quoted in McClelland)*
>
> *It is possible that Time, the essential element, matrix, and measure of all known animal art, does not enter into vegetable art at all. The plants may use the meter of eternity. We do not know. (Le Guin 624)*

In December 2017, a bitcoin (BTC) pushed $20k, ether (ETH) soared over $1000 and ripple (XRP) jumped from $0.22 to $3.32. These are cryptocurrencies, digital money built on a secure database called a blockchain. The story currently told about blockchains is tale of get-rich-quick fueled by a FOMO – fear of missing out – instilled by real-time media. Blockchains did not always create the latest financial bubble, and cryptocurrencies are just one use of the technology. First described in the 2008 paper, "Bitcoin: A Peer-to-Peer Electronic Cash System" authored under the pseudonym Satoshi Nakamoto, the technology removes the need for banks and payment systems and promises to disrupt traditional economic relationships and financial institutions by enabling secure transactions without the need for a trusted third party (8). As a full copy of the data is stored by every computer participating in the network, blockchain evangelists believe the technology will transfer power from institutions to individuals. Where the Web follows a centralised model storing data on a single computer, called a server, blockchains store data on all participating computers in a distributed, peer-to-peer, network. Network consensus and cryptographic proof allow people to transact with low risk of foul play as a single coin or asset cannot be used twice.

Blockchains are capable of impartially enforcing the rules and protocols they are programmed with, but humans are still needed to implement them. Vili Lehdonvirta suggests that in discussions of blockchain governance, the enforcing and the making of rules are often conflated. On the Bitcoin and Ethereum networks, currently the two largest blockchains, most rules are made by close-knit communities of developers who interact in tech hubs, conferences, and through Web platforms like Twitter, Medium, Slack, Github, and Meetup. The rules decided on by core developers must be upheld by an increasingly limited pool of 'miners' who vote with their computational power to solve puzzles that keep the networks secure.[1]

This essay focuses on the way blockchains construct time and the implications that has on governance, paying particular attention to the original Bitcoin network. Blockchains enforce succession through consensus, and for this reason, the philosopher Nick Land argues that "The Blockchain solves the problem of spacetime". I use Land's argument as a starting point for understanding the crucial role time plays in the governance of blockchain networks. I ask if the technology can, in fact, be understood to solve the problem of absolute succession, to investigate ways in which forking, both a byproduct of distributed consensus and the mechanism through which blockchains are upgraded, breaks the power concentrating around Land's definite article Blockchain.

## Blocks and chains

> *The Times 03/Jan/2009 Chancellor on brink of second bailout for banks. (Bitcoin Wiki)*

The Bitcoin network launched in January 2009 encoded with a message critiquing government support of the banking system. The prototype blockchain network proposes a cryptographically secure database structure to create a medium of exchange and store of value not tied to a nation state. All nodes in the network are required to store a full copy of the data and agree on a time-stamped record. In the Web's centralised model, when a server is compromised or goes offline, the data stored on it can no longer be accessed. The blockchain is said to distribute risk and provide greater network strength as the data cannot be compromised by losing any node in the network (Nakamoto). Data about new transactions, or changes to the existing database, need to be broadcast to the whole network so each node can update its record and reach agreement on the correct order of transactions. Blockchains do this through what is called a 'consensus mechanism', and there are many different and debated models. Hash-based proof-of-work is the consensus mechanism proposed by Nakamoto and Bitcoin, and is currently used by the Ethereum network amongst others. In proof-of-work, computers called miners compete to solve puzzles that keep the network secure.

The formation of a new block begins with a miner taking a unidirectional cryptographic hash of new transactions. Hashing takes the data and compresses it into a long hexadecimal number that represents the original data in much less information, allowing it to be broadcast to the other nodes. Each miner collects new transactions into blocks and competes to solve a computational puzzle. The network sets the difficulty of the puzzle based on the amount of computational power available, specifying how many of the first digits of the hash must be a '0'. Like the rolling of many 16-sided dice to find a specific number of 0s in a row, it is highly unlikely that a mining node will find this sequence of 0s when hashing a set of transactions into a hexadecimal number. To satisfy the difficulty, the miner adds random bits of data, called a 'nonce', to the end of the file that contains all of the transactions. Each new nonce is a new chance that the data will encode into a hex number with the sequence of 0s specified. When a mining node finds a nonce that satisfies the difficulty, it broadcasts the block to the network, which as of writing would be around block number 500010. All the other nodes can then perform a hash on the same set of transactions with the same nonce to verify that the resulting hash satisfies the difficulty. New blocks are accepted if the transactions contained within it are valid and not already contained in a block, and this is confirmed when a node begins to work on the next block in the chain, such as number 500011. Each block is signed with data representing the previous block and with a timestamp in the standard of Unix time, which counts the seconds since 1 January 1970, making it more difficult to falsify the time at which the block existed. Bitcoin limits new blocks to ten-minute intervals, creating a regular rhythm to Bitcoin time.

## "The blockchain solves the problem of spacetime"

In a video lecture dated 3 October 2015, Land asks if we are dealing with blockchains or the Blockchain, a universal and singular blockchain network ("Nick Land 'The Blockchain

Solves the Problem of Spacetime.'"). October 2015 was before the speculative rise of the blockchain and the liquid cryptocurrency investment market. Ethereum launched that year in July, and a bitcoin cost $244 (CoinDesk). Assuming the definite article, and in stating that the Blockchain "solves the problem of spacetime", Land constructs a problem around Einstein's theory of relativity for its rejection of absolute and successive time. In Land's estimation, the Blockchain makes it impossible to be post-Kantian, basing his claim on a synthesis of Kant's definition of space as geometry and time as arithmetic dominated by succession.

For Kant, space and time are opposed elements of perception, and not things that exist independently. Space is not an intrinsic property of things but rather the subjective conditions required for perception of outer appearances, an empirical reality required for perception of the external world (Kant 64). Conversely, time is not something which exists by itself, or as a determination of outer appearances, but rather as the form of inner sense (Kant 69). Land opposes the impossibility of post-Kantianism with spacetime. For Einstein, space and time are physical realities. He situates the problem of synchronicity in space, framing it as the problem of knowing that two watches in two different places are displaying the same time (Einstein 3). In spacetime, physical reality is a synthesis of space, time, and matter (Mahalanobis, in Einstein XXII). While Kant understands space and time as components of the mind and how it experiences the world, Einstein makes space and time a physical reality. In enforcing absolute succession through consensus across a distributed network of computers, the Blockchain presents time as separate from space, which Land argues scrambles the notion of 'pre' and 'post' and the "actual set of successions". While Land heralds the Blockchain for providing "artificial absolute time for the first time ever in human history", in placing the Blockchain both post-spacetime but not post-Kantian, technological and theoretical development become neither linear nor successive. Time gets slippery.

## Time is money

The definite article Blockchain, as put forward by Land, proposes a theory of time that is against not only Einstein, but many other modernist and postmodernist thinkers: Hannah Arendt, Claude Levi-Strauss, Gilles Deleuze, and Karen Barad (to name only a few). Looking at a single blockchain, like Bitcoin, the network maintains consensus on a single record of events. If nodes receive different versions of the next block, the longest chain is always taken to be correct, meaning it was created first and indexes the most computational power (Nakamoto 5). Due to the time it takes for information to spread across the network, there might be multiple chains with different versions of the next block at any given moment. This is called a fork and is a byproduct of distributed consensus. As more blocks are added to the competing chains, eventually the one that is the longest and indexes the greatest proof of work will be taken to be correct. Nodes working on the other chain will discard it, creating what is called an 'orphaned block' (Blockchain.info). As the longest chain is always taken to be correct, falsifying the blockchain would require redoing every previous proof of work, making it impractical and costly. When miners create a valid block, they are rewarded with bitcoins. In the blockchain universe, a coin is a nonreversible chain of digital signatures (Nakamoto 2). Each bitcoin is backed by its own transaction history, ensuring it can only be transferred by its owner. Time, or more

precisely the arithmetic succession of blocks, becomes money, and it is an exponentially increasing supply of electrical energy, most often carbon-based, that keeps the clock ticking (Vries).

In *Capital Volume 1*, Marx delineates the mechanisms through which capitalism transforms time into money. Commodities only have value, he says, because abstract human labour is materialized in them (Marx 311). The quantity of the labour is measured by its duration, which Marx calls labour time. Measured in hours or days, labour time becomes value itself. The value of the textile factory worker, for example, is the amount of time they spend operating a loom, exchanging each hour of labour for a government backed currency like Pound Sterling or the Dollar. During the industrial revolution these currencies were representative, meaning backed by a commodity like gold or silver. Time is turned into value and is exchanged for a token with no intrinsic value, but for a symbolic guarantee that the money can be exchanged for a commodity. The United States ended the gold standard in 1971, turning the dollar into a full fiat currency, meaning its value is controlled by the U.S. Federal Reserve through policies that control the supply of money and set interest rates (Lowrey). Today, most currencies no longer guarantee a commodity and their value is reliant on nation states.

Cryptocurrencies fold together the measure of the value-forming substance and the medium of exchange. For Marx, time is the measure of labour, the value-forming substance, and is exchanged for a currency. For Bitcoin, and other networks that use proof of work, the value-forming substance is the electrical energy that powers arithmetic succession. In the 19th century, observations of energy dissipation and heat transfer came to defend the irreversibility of time. The Second Law of Thermodynamics states that a system becomes statistically more disordered as it moves through time. This was taken to prove linear and successive progress, which Marx defends though his historical materialism and theories on the development of society. Bitcoin builds on Nick Szabo's notion of 'bitgold'. Computationally intensive puzzles, that consume increasing amounts of electrical energy, are used to create digital assets that are scarce, unforgeable and have value independent of third party due to the cost of their creation, similar to a precious metal. Cryptocurrencies, backed by a transaction history recorded in a secure blockchain-based database, are a medium of exchange that derive value by measuring the value-forming substance – most often electrical energy – through the linear succession of blocks.

In folding together the measure of a value-forming substance and the medium of exchange, blockchains further abstract the human labour from the creation of value. Blockchains are heralded for their ability to enable a machine to machine economy, capable of transacting without the need for human oversight (Hannaert). With proof of work, Bitcoin demonstrated cryptocurrencies as a means of building infrastructure. People who join and maintain the network as miners are paid rewards in bitcoin for solving the computational puzzles that keep the network secure. Called crypto-economics, this is the design of how the network drives people to do certain things. In "Fragment on Machines", Marx prefigures the current blockchain paradigm of dehumanisation through economic incentives:

> *In machinery, knowledge appears as alien, external to him [the worker]; and living labour [as] subsumed under self-activating objectified labour. The worker appears as superfluous to the*

> *extent that his action is not determined by [capital's] requirements. (Marx, "Fragment on Machines" 53)*

Cryptocurrencies design capital to determine specific actions. A blockchain is an automated rule enforcement machine, and the most common rules are around the creation of new blocks. Once set into motion, the possibility of a new block requires that transactions have occurred, and that computers are connected to the network and to a power source. Humans are needed to set blockchains into motion and to keep computers connected to the network.

Bitcoin proposed the Blockchain as a system that folds the measure of a value-forming substance into a medium of exchange, that designs human behaviour by manipulating the movement and location of money. That money is not defined politically but by the conditions that create it and its own transaction history, and is digitally stored within a linear and successive chain of blocks. Bitcoin is only the prototype blockchain network and brings together the distributed ledger technology with a cryptocurrency. While cryptocurrencies may derive value from irreversible succession, blockchains cannot be said to create absolute succession and solve the problem of spacetime as each chain is defined by locally variable characteristics that must be established as, and remain, valuable.

## The politics of synchronization

In his treatise on Poincaré and Einstein's endeavours to coordinate time, Peter Galison shows how the synchronization of clocks was at the modern junction of knowledge and power, cutting across physics, engineering, philosophy, colonialism, and commerce. Pragmatic questions, such as how to synchronize two clocks in different places, ultimately led era defining theoretical arguments on the nature of time as relative to be built into seemingly inconspicuous technology like clocks. Theory had become a machine (Galison 74). While blockchains, as automated rule enforcement systems, seem opposed to an anthropocentric worldview, the linear time defined by the immutable succession of blocks is fundamentally based on the way humans perceive time. Spacetime, as a single four-dimensional fabric, opposes the correlation between thinking and being. In spacetime, human perception of the physical world, or their experience of duration, does not figure.

Not only is the notion of time as successive and linear constructed by the Blockchain, but it also seems to enframe conceptualisation of it. Fred Ehrsam, founder of the cryptocurrency exchange Coinbase, likens the development of the distributed databases to evolution, suggesting only a "Cambrian explosion" of economic and governance designs can provide solid foundations of blockchain-based life (Ehrsam, *Blockchain Governance*). Evolution assumes time as something linear and successive, where the past moves towards the future. In the myth of social and technological progress, things get better. The storm of progress propels the angel of history into a future they cannot see.

In "Notebook V" of the *Grundrisse*, Marx suggests capital paradoxically pushes beyond spatial barriers without always surpassing it. Rather, Marx argues, capitalism generates its own resistances and contradictions to the universalization of exchange. Ernst Bloch termed this the contradiction of the nonsynchronous, arguing that under capitalism people are seen to be living at the same time, while not existing in the

same Now. Examining the rise of National Socialism among rural peasants in 1930s Germany, Bloch suggests that contradictions between the uneven universal time of capitalism and the "good old days" creates anger and resentment that can be easily be exploited by those vying for political power. If the definite article Blockchain creates artificial absolute time, then multiple blockchains, with different rules that determine the creation of new blocks, suggest a new form of nonsynchronicity. The Polkadot network, called a heterogeneous multi-chain, wants to allow these independent blockchains and their records of events to exchange information and transact. Interfaces emerge to govern the conditions of exchange between Nows out of sync.

The sharing of fundamentals is another sense of synchronization. This describes the syncing of parts of a given social context, the effects of shared infospheres or filter bubbles accessed through mobile devices loaded with social media. This form of synchronization forms the context in which collective decisions are made, impacting the mechanisms of governance. Charting the transition from a democracy of opinion, Paul Virilio argues that the current regime is comprised of the synchronization of emotions (31). This, he suggests, leads to reactionary political responses and an emphasis on the short term and immediate. A symptom of emotional democracy is FOMO, and can help to explain the rise of the cryptocurrency economic bubble. Experiencing the meteoric rise of cryptocurrency prices together, people have begun flocking to the virtual money machines for fear of missing the next great rally and chance to get rich quick.

# Forking in time

Forking is the main mechanism through which blockchain time splinters and allows the irreversible sequence of blocks to be broken. It is a byproduct of distributed consensus, leaving chains and their alternative sequences of events 'orphaned', or no longer part of the main chain. Public blockchains can adopt new rules through forks which are hard, meaning not compatible with the previous software, or soft, meaning backwards compatible such that new blocks can be accepted by nodes running the old software. In a hard fork, a developer or miner clones the data intentionally, replicating the chain of blocks to create a new network with different rules. On 1 August 2017, there was a hard fork of Bitcoin, creating a new chain called Bitcoin Cash. A subset of participants in the Bitcoin network wanted to prevent a soft fork that would change how transaction signatures were stored (Bukov). Hard forks are often a last resort means of overcoming the inability of the community to reach consensus on potential software upgrades, and here the disagreement was over how to best speed up transaction times. What is unique about forking is that since it creates a copy of the existing database, users and coin holders who might not have the technical knowledge or social status to affect a fork, are also implicated. Any person holding bitcoin at the time of the split received an identical amount of bitcoin cash.

Hard forks cause not only the database to split, but also its polis, the community of miners, developers, and users who must choose which software to support. Newly forked blockchains can only remain secure and valuable if there is a diverse pool of miners who continue to keep their databases in sync. Bitcoin Cash was a high profile fork of the largest cryptocurrency in the midst of

a raging financial bubble, and the decision to continue supporting either network was a financial decision. As of June 2018, Bitcoin Cash is the fourth largest cryptocurrency with a market capitalization of $15 billion and a price of $887 per coin (Coin Market Cap). For context, this puts Bitcoin Cash at around the same valuation as the Gross Domestic Product of Jamaica or Malta (International Monetary Fund). But most hard forks do not create the astronomical financial value of Bitcoin Cash. The website Coin Market Cap indexes 1531 cryptocurrencies. Hundreds of coins have a value less than one cent and market capitalizations under $1000. For 0.01000 BTC (about 50 Euros), Forkgen will create a custom hard fork of the Bitcoin network. These blockchain networks with medium to low market value oppose Land's notion of the definite article and suggest a world outside of blockchains at the scale of nation states.

Founder and developer Trent McConaghy calls for tokenizing the enterprise and suggests hard forks as a means of fueling the distribution of network value back to the community that produces it. Forking closed or proprietary databases is not possible, putting most of the Web off limits. The business model of Web platforms like Google, Facebook, Uber, and Amazon is based on the unidirectional capture of the value users produce in exchange for access to the services provided. As cryptographically secure rule enforcement machines, blockchains lower the variable cost of operating a secure database, in turn lowering the cost of making changes to that database. McConaghy cites the Coase Theorem, which states that organizations grow disproportionately large when transaction costs within an organization are lower than between organizations. Since blockchains make the cost of transacting within and between organizations effectively the same, McConaghy argues that by allowing for forking, public blockchains enable more fluid, self-organized communities: "The community can decide if it has the courage to embrace change […] if some subgroup doesn't agree, it can splinter off (yes, fork) to do its own thing. […] Communities can self-organize around the original community or the new one, based on their beliefs." Whether or not blockchains do, in fact, do this is not the point. Rather, what is interesting is the fundamental role forking plays for McConaghy and its absence from Land's argument altogether. While both see the value of blockchains collectively produced and captured through distributed consensus, only McConaghy's blockchain, with its emphasis on community-driven forking, attempts to reverse the chain of value production from the network to its polis.

Bitcoin emerged from small group of libertarian cypherpunks working to create a liberation technology capable of distributing power away from traditional financial and political institutions through cryptographic security: "Technology represents one of the most promising avenues available for re-capturing our freedoms from those who have stolen them" (Hammill). But as Bitcoin grew into a global network, it drew in stakeholders with different values, including the banks and governments it originally sought to undermine. The Blockchain is also bolstered by those waging an assault against liberal democracy. Neo-Reactionaries, of which Nick Land is a key theoretician, advocate an 'accelerationism' that pushes capitalism to its most destructive and dehumanising limits with the help of cryptocurrencies seemingly purified of politics ("The Dark Enlightenment."). Land's transhumanist position, suggests the philosopher Yuk Hui, drives for a meltdown of society through the absorption of all cultural relativity into an intelligent cybernetic machine. This helps to contextualise Land's desire for the definite article Blockchain

and his problematization of spacetime. The impossibility of post-Kantianism is also the impossibility of cultural relativity and the impossibility of a decentered Western canon of knowledge. Hui suggests, in the face of this rising neofascist movement, the pluralisation of time not only becomes a radical practice, but a means of building the world to come. Hui calls "to fragment the world according to difference instead of universalizing through the same; to induce the same through difference, instead of deducing difference from the same".

As a secure database that folds the measure of a value forming substance into a depoliticized medium of exchange, the Blockchain seems like it might be capable of absorbing all cultural relativity into an intelligent cybernetic machine. That is until it is forked. Forking might not fragment the world, but it does fragment each network and alter the way it produces value. As a provisional conclusion, I advocate forking as a means of breaking the power concentrating around the definite article Blockchain, to reconstruct the framework through which the value of the technology is established. Like other socio-technical systems, blockchains are unable to ensure self-governance through technology alone. Time provides a lens for glimpsing the political economy of blockchains and forks help to reveal their entanglement with a *polis*, a citizenry of developers, miners, and coin holders. Blockchains hide the sites from which new rules emerge, relocating governance processes to the design of market incentives, the design of the conditions under which new blocks are created, and the moments around the hard and soft forks that alter the software. These hidden governance processes impact the production and accumulation of value, and are ultimately responsible for directing its flow.

# Notes

[1] Currently 70% of miners are based in China, and 70% use hardware made by one manufacturer (*The Economist*). But as China begins to ban cryptocurrency exchanges, miners are leaving the country, making blockchain's entanglement with the 'off-chain' world apparent.

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Tega Brain

# THE ENVIRONMENT IS NOT A SYSTEM

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**Figure 1: Seagrass in Tasmania, Australia. Credit: Tega Brain.**

In late 2017, Microsoft's chief environmental scientist, Lucas Joppa announced AI for Earth, a new initiative to put artificial intelligence in the hands of those who are trying to "monitor, model and manage the earth's natural systems". AI for Earth gives environmental researchers access to Microsoft's cloud platform and AI technologies, and similar to recent initiatives by companies like Google and Planet Labs, it aims to integrate AI into environmental research and management.

It is obvious that Silicon Valley stands to profit handsomely from the uptake of AI in environmental research and management, as it has from the application of these methods in a diverse range of other fields. From urban design to the justice system, decision making processes are being automated by data-driven systems. And in spite of a growing body of criticism on the limitations of these technologies,[1] the tech industry continues to promote them with the mix of solutionism and teleology that imbues Joppa's words. He urges: "for every environmental problem, governments, nonprofits, academia and the technology industry need to ask two questions: 'how can AI help solve this?' and 'how can we facilitate the application of AI?'" (Joppa)

This paper considers some of the limitations and possibilities of computational models in the context of environmental inquiry, specifically exploring the modes of knowledge production that it mobilizes. As has been argued by authors like Katherine Hayles and Jennifer Gabrys, computation goes beyond just reading and representing the world. As a mode of inquiry it has a powerful world-making capacity, generating new pathways for action and therefore new conditions. "Computing computes."[2] Computational metaphors are also pervasive as framing devices for complex realities, particularly in the context of research on the city, the human brain or human behavior.[3]

Historic computational attempts to model, simulate and make predictions about environmental assemblages, both emerge from and reinforce a systems view on the world. The word eco-*system* itself stands as a reminder that the history of ecology is enmeshed with systems theory and presupposes that species entanglements *are operational* or *functional*. More surreptitiously, a systematic view of the environment connotes it as bounded, knowable and made up of components operating in chains of cause and effect. This framing strongly invokes possibilities of manipulation and control and implicitly asks: *what should an ecosystem be optimized for?*[4]

This question is particularly relevant at a time of rapid climate change, mass extinction and, conveniently, an unprecedented surplus of computing. As many have pointed out, these conditions make it tempting (and lucrative) to claim that neat technological fixes can address thorny existential problems.[5] This modernist fantasy is well and truly alive for proponents of the smart city, and even more dramatically in proposals for environmental interventions that threaten to commodify earth's climate conditions, such as atmospheric engineering.[6]

What else does a systems view of the environment amplify or edit out? This discussion revisits several historic missteps in

environmental measurement and modeling in order to pull focus on the epistemological assumptions embedded into a systems perspective. It then asks, what are other possibilities for ecological thought? Does AI have any potential to reveal environments in ways that escape the trapping of systems? Critical to my inquiry is the recent work of Anna Tsing and what she calls, "the arts of noticing". Tsing's work offers a starting point for thinking outside of both a systems framework and assumptions of progress (17). Her perspective on ecology and the lifeworlds it describes unfolds and emerges through "encounters" (20) which bring together entities, transforming them in indeterminate ways. Might AI operate through modes of environmental encounters or will it simply amplify "an informatics of domination" (Haraway 162)?

## The poverty of numbers

A systems view of the environment reinforced by computation, has numerous precedents, including 18th and 19th century attempts at scientific forest management. This early attempt at centralized ecosystem management through numerical modeling foreshadows the contemporary use of these approaches in the context of computation. James C. Scott traces how the introduction of centralized forestry required forests to be made legible in new ways.[7] Trees in forests were measured, quantified and modeled to optimize harvest and replanting for timber yield. Thus the fastest growing species were replanted in felled areas, and trees became viewed as autonomous machines for producing wood. Those species not harvestable for timber – low lying bushes, fungi and plants (Scott 13), as well as traditional 'unofficial' use of forests by local communities – were edited out of the system (Hölzl 436). These scientific or fiscal forests, were managed with the assumption that complex species entanglements were irrelevant and could be treated as external to a system designed to efficiently transform trees into commodities. Yet after a couple of generations of felling and replanting, yields began to drop and the health of managed forests deteriorated (Scott 20). Viewing the forest as a factory oversimplified the reality of the relations and interdependencies of its species.

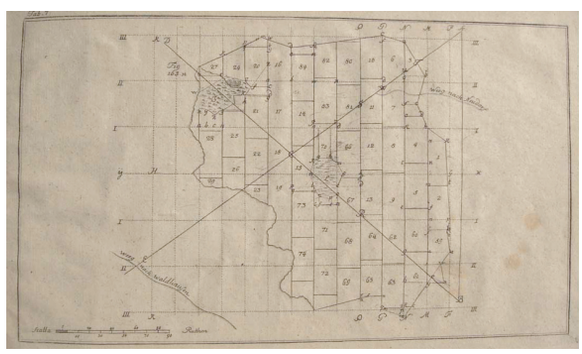

**Figure 2: Imaginary forest patch partitioned in 84 sections. Credit: Grünberger, G. (1788) Lehrbuch für den pfalzbaierischen Förster, Vol. 1 (München: Strobl), Figure 163 from Historicizing Sustainability: German Scientific Forestry in the Eighteenth and Nineteenth Centuries (Hölzl).**

The scientific forest failed by its own criteria: timber yield. However it is worth acknowledging that if yield had remained high while biodiversity declined, this history of sustainable environmental management would be remembered as a success, analogous to industrial agriculture. Tsing calls environments that are simplified and optimized to produce commodities "plantations" (435). The economic drivers of capitalism make crop yields the ultimate goal of agricultural landscapes, and shape how they are measured, modeled and manipulated. When a landscape is managed as a factory, its species become assets alienated from their lifeworlds[8] like workers who fulfill HITs on Mechanical Turk with no bearing on each other or what they produce. When the asset

can no longer be extracted, the landscape becomes a ruin and disappears from view, deemed worthless (Tsing 31). Both the plantation and the scientific forest are the results of numerical approaches to landscape management applied in the name of economics. They highlight that data collection and modeling practices are never neutral. Rather, they are contingent on decisions of what is deemed important or trivial in the eyes of the manager and therefore are profoundly driven by culture and economics, class and race.

## The fantasy of stability

In the twentieth century, the science of ecology emerged in dialogue with cybernetics and systems theory. There is a rich body of literature critiquing how these conditions influenced environmental research. [9] Cybernetics, first defined in the 19th century by André-Marie Ampère as "the science of governance" was catalyzed as an interdisciplinary field by proponents like Norbert Wiener in the post war decades.[10] It inspired ecologists to pursue questions of control and self regulation in the context of species lifeworlds. Some early ecosystem diagrams were even realized in the style of circuitry.

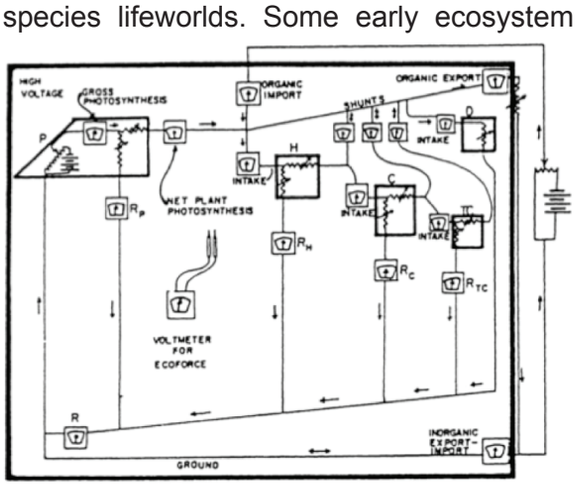


**Figure 3: Prominent biologist of the 1960s, Howard Odum's first presentation of an ecosystem using the symbolism and aesthetic of electric circuit diagrams. Image by Howard Odum, 1960 cited in Madison (218).**

Botanist Michael Tansley was among the first to use the term "ecosystem" in 1935 to describe the "systematic" functioning of forests, grasslands and wetlands environments. He saw ecosystems as "the whole system (in the physical sense), including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment of the biome [… these] are the basic units of nature" (299). Like the scientific foresters, Tansley proposed that ecosystems were made of discrete stable units, interacting in ways that tend towards a state of dynamic equilibrium. He also assumed that natural selection favors stability, that "systems that can attain the most stable equilibrium, can survive the longest" (Tansley 299). This idea of ecological equilibrium remains stubbornly influential, as does the idea of the environment as a unified "whole". As philosophers like Bruno Latour and Timothy Morton discuss, the idea that the "natural world" exists in a balanced harmonious state that is then disrupted by humans reiterates the misconception that humans and environment are separate.[11]

Towards the late 1960s, Tansy's assumption of ecosystem homeostasis was proving difficult to verify, even in ambitious large-scale ecosystem modeling projects enabled by the availability of computation. One such project was the Grasslands Biome, started in 1968 at Colorado State University. It was an unprecedented attempt to comprehensively model a grasslands ecosystem with a computational model and aimed to uncover new ecological principles (Kwa 1). Employing hundreds of full time researchers, the project involved extraordinary methods of data collection as researchers tried to account for all forms of energy entering and leaving the system, attempting to quantify everything eaten and excreted by

all organisms in the biome and then inputting this data into a mathematical model. Students and researchers would follow animals around the grasslands whispering into tape recorders. They would 'collect' animals and analyze their stomach content by inserting probes into their digestion systems (Coupland). Soil microbiology was also studied, yet soil invertebrates and highly mobile species such as insects and birds remained frustratingly uncooperative in yielding information to researchers (Coupland 35).

Despite this labor, the Grasslands model, like similar large-scale ecological modeling programs of the time, revealed very few new ecological principles. Deemed "too simplified biologically" despite implementing an unprecedented number of variables (Coupland 154), the model was built with an assumption of default equilibrium. Coupland argues that the Biome Model was simply "a sophisticated version of a cybernetic system […] and cast […] the ecologist in the role of systems engineer" (146). The project disproved its foundational hypothesis – that complex ecological realities can be reconciled with mathematical models and be described as abstracted structures of inputs and outputs. "The grandiose ideal of achieving total control over ecosystems, which around 1966 appealed so much to systems ecologists as well as politicians, was dismissed as a hyperbole" (Coupland 155).

**Figure 4: Processing of replicate biomass samples, ready for drying and weighing, in the field laboratory at the CPER/Pawnee grassland site, Colorado, USA. Credit: Larry Nell, Colorado State University, July 1971.**

Data collection and modeling practices remain shaped by what is considered typical or atypical, important and peripheral – summations of the boundary conditions of reality. However making these assumptions is difficult. Even with the growing capacity of contemporary computing, it is dangerous to simply assume that more data equals more reality. An example of this is the story of how Joe Farman, a British geophysicist working for the British Antarctic Survey, first observed the destruction of the ozone layer. Farman maintained a single ground based ozone sensor in the Antarctic throughout the 1960s and 1970s, and continued to do so in spite of the launch of NASA atmospheric monitoring satellites that collected vastly larger quantities of data (Vitello). When Farman's sensor began to show a 40% drop in ozone levels in the early 1980s, he assumed it was damaged and replaced it as NASA's atmospheric models had reported no such change. After years carefully checking, Farman published this alarming result in *Nature* as the first observation of the destruction of the ozone layer due to human pollutants. Until then, this had been only a theoretical hypothesis.[12] How had NASA's satellites missed such a marked change in ozone composition? One response from NASA suggests that their data processing software was programmed to discard readings that appeared to be outliers, thus ignoring the drastic changes that were occurring in ozone concentration (Farman). In this case, reality itself was an outlier and assumed to be an error.

## The limits of machine learning

What if there was no cap on the amount of data produced from an environment for analysis? Could models be derived from from datasets rather than built from theory to avoid erroneous assumptions like those made in the Grasslands model? Could machine learning be adopted to deal with quantities of data beyond human comprehension and prevent any need for discarding outliers? Can these techniques produce a more robust representation of reality, free of human judgement?

These are the arguments made for machine learning. In 1959 Arthur Samuel defined machine learning as "the ability to learn without being explicitly programmed" (McCarthy). Rules are derived from patterns in large data sets, rather than programmed based on theoretical knowledge of underlying structures. "Correlation is enough. We can stop looking for models" proclaimed *Wired* editor Chris Anderson in 2008, in an article titled "End of Theory". In other words, had the Grasslands model been derived through machine learning, energy flows through the ecosystem could have been estimated based on correlations the data, rather than estimated from inputting data into a theoretical model, hardcoded from hypothesis of ecosystem dynamics. Although this would have prevented erroneous assumptions like default homeostasis, it is important to acknowledge that machine learning substitutes one set of assumptions for another.

Machine learning assumes that enough data can be collected to adequately represent and make predictions about reality. In the context of the environment, this is an enormous challenge given the very limited size of our existing datasets. Another significant assumption is that the past is indicative of the future. Yet as the sudden unprecedented depletion of atmospheric ozone in the 1980s shows, this to not always be the case. Similarly, climate change means our ability to make accurate predictions from our existing data is diminished. Many environmental datasets like precipitation records span 250 years at best, with the majority spanning a much shorter period.[13] From a geological point of view this is an absurdly small slice of time, and one in which the earth's climate has been relatively stable. As the patterns, rhythms and cycles in both climatic and biological phenomena are drastically disrupted, it becomes increasingly difficult to make predictions based on this short, stable interval of climate data. William B. Gail calls this the coming of "a new dark age", where the accumulated observations of Earth's irreducibly complex conditions are increasingly rendered obsolete. If machine learning approaches are to be adopted, it is important to recognize the limits of these methods.

## Dreams of objectivity

Another prominent argument made for the use of AI methods is that data-driven approaches neutralize human decision making by simply representing the world as it is. The proponents of AI for Earth also make these claims to objectivity: "Decisions about what actions to take will be easier to make — and less vulnerable to politicization — if we know what is happening on Earth, when and where. AI can help to provide that information." (Joppa) However in other realms, AI systems continue to reveal and confirm biases and structural inequalities rather than offering an easy pathway to their neutralization.

For example, defendant risk scoring systems designed to help judges make

decisions to "deliver better outcomes to all who touch the justice system" (Equivalent) have been shown to score black defendants at significantly higher risk for reoffense than white defendants with similar or worse criminal records (Angwin et al.). Systems like these should serve as warnings to other industries implementing automating decisions making, even in the name of environmental management. As theorist Françoise Vergès argues, "adaptation through technology or the development of green capitalism […] does not thoroughly address the long history and memory of environmental destruction […], nor the asymmetry of power." Contemporary environmental challenges directly emerge from violent histories of colonialism, imperialism and the ongoing exploitation of marginalized communities or those living in the global South (Vergès). As such, there is no reason to suggest that AI technologies built and implemented by a cohort of wealthy white men in the US will in any way manage or distribute environmental resources in ways that are equitable for everyone.

Technologies will only ever provide partial fixes if they are not accompanied by shifts in perception and values, along with regulatory change that addresses histories of injustice and "the tradition of belief in progress" (Vergès). More efficient resource use in a system of deregulated capitalism is most likely to beget further resource use rather than net reduction. Microsoft seems to have it backwards in its mission statement "to empower every person and organization on the planet to achieve more". Wasn't the idea behind technologies of automation to empower us to achieve less? Or at least prompt a radical rethinking of what 'more' is? As Vergès argues, if these logics go unquestioned, mounting environmental challenges will not only continue to accelerate change in an already stressed biosphere, but also further augment environmental injustices.

## If the environment is not a system, then what is it?

How else might we think of environments in lieu of the systems metaphor? Tsing offers the concept of assemblage and here I build on her work, understanding environments as open ended assemblages of non-humans, living and nonliving, entangled in ways of life.

> *Ecologists turned to assemblages to get around the sometimes fixed and bounded connotations of ecological 'community.' The question of how the varied species in a species assemblage influence each other — if at all — is never settled: some thwart (or eat) each other; others work together to make life possible; still others just happen to find themselves in the same place. Assemblages are open-ended gatherings. They allow us to ask about communal effects without assuming them. (Tsing 54)*

Like Tsing, many authors have taken up the concept of assemblage to round out the simplification and abstraction connotated through use of technological metaphors. Following Latour, to assume a system is also to surreptitiously assume "the hidden presence of an engineer at work", a presence that suggests intention and that what we can see are parts of a unified whole (*Some Advantages of the Notion of "Critical Zone" for Geopolitics*, 3). Assemblage relieves us of this view, instead suggesting a collection of entities that may or may not exhibit systematic characteristics. The edges of an assemblage are fuzzy – modes of interaction are always shifting and agencies within them are heterogeneous. Katherine Hayles also invokes the term in her inquiry on

cognition in complex human technological entanglements, what she calls "cognitive assemblages" (*Unthought* 3). Hayles chooses assemblage over network arguing that network conveys "a sense of sparse, clean materiality", whilst assemblage offers "continuity in a fleshy sense, touching, incorporating, repelling, mutating" (118). She continues: "I want to convey the sense of a provisional collection of parts in constant flux as some are added and others lost. The parts are not so tightly bound that transformations are inhibited and not so loosely connected that information cannot flow between parts" (118). Similarly, I take up assemblage as an imperfect descriptor to avoid the hubristic assumptions of a systems view. Stating "I am studying a grasslands assemblage" instead of "I am studying a grasslands system" produces a remarkable shift in expectations and assumptions. This simple substitution dismantles subtle assumptions of fixed categories of knowledge, as well as assumptions that engineering and control are always possible. Instead it foregrounds uncertainty and acknowledges the unknowability of the world.

Rather than describing ecology through interactions or exchanges between entities, Tsing proposes that it emerges through encounters. For Tsing, encounters open new possibilities for thinking. They produce transformation and are therefore indeterminate (63). They are also non-human centered. There can be encounters between different species – say a mushroom and a pine tree – or between lifeforms and non-human materials. Components of a system are implied to be static discrete units, leaving out processes of contamination and transformation. For example when predator-prey relations are described as transfers of energy between components in a system, say a walrus eats a mollusc, it is inferred that the walrus remains unchanged by the encounter. Seeing the world as made up of individuals sealed off from one another, allows for the assumption of stable categories, and makes the world easier to quantify through data, interpreted as pattern and codified as algorithm. The yield from a data-driven mode of knowledge production is obviously rich and wide reaching, providing new insight into phenomena like climate change. And yet, as the story of Farman's attention to the atmosphere shows, scaling and automating data collection processes can risk overpresuming the stability of the world and blind us to transformations outside of assumed possibility spaces.

In this way "smartness", in its current form, produces a kind of myopia. A smart city, home or environment contains networks of sensors automatically pinging data back to servers to train machine learning models of the world. Indeed this is also Joppa's pitch for AI for Earth: "AI systems can now be trained to classify raw data from sensors on the ground, in the sky or in space, using categories that both humans and computers understand, and at appropriate spatial and temporal resolution." This statement is worthy of carefully consideration. Firstly, how does one decide on an appropriate temporal resolution? In the case of the German forests, it took nearly a century to see that management methods were unsustainable because the life rhythms of a tree are at a vastly slower tempo than those of human economies. Joppa also infers that the world can be revealed by how it appears through "raw sensor data". Yet this implies the sensors themselves as somehow neutral and overlooks the layers of human decision making that has occurred in their production and installation.[14]

It can also be surprisingly difficult to resolve the world into clearly defined categories. And are these categories stable? Tsing's argument that encounters produce transformation suggests that neat taxonomies will

never fully accommodate the fluidity and uncertainty of the world. This is particularly apparent in plant systematics where even the definition of species is contested and ever changing (Ernst). In trying to categorize plant specimens, a tension can emerge between how the specimen appears – its phenotype, and how it appears on a genetic level – its genotype. As genetic sequencing techniques have become cheaper and therefore more widely available, plant scientists sometimes find that the species indicated by phenotype does not always match up to the genotype – a discovery that has caused many herbaria to be reorganized. However even when identifying specimen on a purely genetic level, there is still dispute over how species are interpreted.[15]

Data-driven research methods necessitate the collection of huge quantities of data and in doing so, they dismantle opportunities for paying close specific attention to the world. These methods also tend to obscure the many other ways of building understanding. Also, perhaps intentionally, data collection increasingly acts to maintain the status quo. We use data to study problems that would be more effectively addressed through simple political action. The impetus to "study the problem" ad nauseam gives the appearance of addressing an issue while perfectly maintaining the present state of affairs.[16]

## Amplifying encounters

How might we reciprocally illuminate the environment and balance our well oiled capacity for imagining it from an all-conquering systems worldview? How might we elevate engagement through the specifics of encounter and narrative?

Ethnography is one possibility. Tsing's study of the matsutake mushroom explores what can be learnt from a Japanese mushroom, a lifeform that cannot be cultivated and that thrives in highly disturbed forests. Through her ethnography she shows how close attention inevitably facilitates transformation. Tsing calls this "the arts of noticing", tactics for thinking without either the abstraction produced by quantification or deeply held assumptions of progress. If we are "agnostic about where we are going, we might look for what has been ignored" (51). As Farman's ozone research showed, paying close attention rather than outsourcing observation and interpretive capacities can reveal the world in different ways. In particular, attention can emphasize the indeterminacy and messiness of encounters outside of an engineering agenda. It can transform the observer, directly involving us in the weirdness of the world.

Could technologies like machine vision and remote sensing be used to amplify environmental encounters and the arts of noticing our ecological entanglements? The rise of digital naturalism sees the development of apps and initiatives that focus attention on the lifeforms in our various bioregions. Initiatives such as *iNaturalist*, *Merlin Bird ID* and *eBird* invite non-scientists to contribute environmental observations and use either crowd-sourced or "assisted identification" to identify species and build biodiversity databases. Assisted identification utilizes computer vision techniques to guide species identification from images by identifying broad categories and making suggestions. Through this process, the system is also gradually being trained, and over time will therefore make better suggestions. Many scientific institutions also hope that data-driven species identification can help to reduce the bottlenecks in identification processes as human taxonomists are in short supply (Kim).

**Figure 5: Deer observations made at the CPER/Pawnee grassland site, Colorado, USA. Credit: Animated GIF made from Adam Curtis' documentary *All Watched over by Machines of Loving Grace*.**

It is also worth emphasizing that these apps do not purport to replace human identification but rather facilitate human computer collaboration to reach conclusions quicker. This is significant, as it shows a way that AI can produce more meaningful environmental encounters rather than automate them away. This use case for AI also serves as a reminder that data can be much more than a material for building a simulation or instrumentalizing whatever is being measured. The act of data collection and collaborative identification can amplify encounters and, by extension, yield transformation or what artist Jenny Odell calls "a certain dismantling in the mind." In observing a local bird, and being assisted to identify it as a magpie, I'm learning and tuning my perception to the lifeworlds I inhabit: I'm subject to transformation.

Accounts of the scientific forest, the Grasslands Biome and Farman's ozone observations, mostly focus on the success or failure of the science – on whether these projects of observation or modeling succeeded or failed in revealing new patterns, on whether the resultant environmental models proved accurate, and, by extension, on whether they produced new possibilities for environmental management and manipulation. But telling these stories like this, is telling them from a systems point of view. And what tends to get overlooked is how these are actually stories of environmental encounter though data collection. As encounters, they are also stories of transformation of both the environments and the humans involved. How did the meticulous observation of the environmental assemblages in question shift and transform the people studying them? In itself, this question rejects a false binary between human and environment. It acknowledges the instability of the observer and the tendencies of Western science to edit out intuition, emotion and philosophical recalibrations. The reciprocal transformation that occurs with attention and encounter, what Nobel prize winning geneticist Barbara McClintock called "getting a feeling for the organism", is not only critical for formulating original scientific hypothesis, but more deeply, for questioning foundational assumptions of what is counted as knowledge and what we then expect knowledge to do.[17] Looking back on the early scientific forests and even on the more recent Grasslands Biome, it is difficult to speculate on how these projects changed the people involved. However, their stories remind us of the irreducibility of an unruly and complex environment. That as hard as we try to contain the world in neat technological metaphors, it will always leak out and transform us.

# Notes

[1] See recent books *Weapons of Math Destruction* by Cathy O'Neil, *Automating Inequality* by Virgina Eubanks, *Code and Clay, Data and Dirt: Five Thousand Years of Urban Media* by Shannon Mattern, and the *Machine Bias* Series published by Propublica and written by Julia Anguin et al.

[2] See Katherine Hayles (*My Mother Was a Computer*, 7-31) and Jennifer Gabrys' discussion in *Program Earth* (11).

[3] Sociologist Shannon Mattern warns of the "the city as computer model" arguing that it often hinders "the development of healthy, just, and resilient cities" (*The City is Not a Compute*r). Psychologist Robert Epstein highlights similar issues in the context of brain research observing that historically, metaphors for cognition have always been drawn from the dominant technology of the time – hydraulics, springs and mechanics, electrical circuits and now computation. Epstein argues that the ubiquity of information processing metaphors in brain research may well be constraining the field by confining hypotheses and explanations to those that align with computational processes. These metaphors equally constrain approaches to environment inquiry.

[4] This question is inspired by Shannon Mattern's discussion of the city as a computer metaphor (*The City is Not a Computer*).

[5] See Bratton et al. (9); Gabrys (230); Stengers (1000), and Szerszynski et al (2818).

[6] See Temple on the planned atmospheric tests scheduled to occur in the US in 2018.

[7] See James C. Scott's well known account of scientific forestry in *Seeing Like a State*.

[8] I use the word 'lifeworlds' following Anna Tsing who describes objects in capitalist exchange as being alienated and "torn from their lifeworlds" (121).

[9] Many authors discuss the influence of systems theory on ecology, such as Elichirigoity, *Planet Management*, and Latour, *Some Advantages of the Notion of "Critical Zone" for Geopolitics*. Some also consider the influence of cybernetics such as Haraway, *The High Cost of Information*, and Jennifer Gabrys, *Program Earth*.

[10] See Wiener's landmark 1948 book, *Cybernetics*.

[11] Latour's concept of "naturecultures" introduced in the *Politics of Nature* is an attempt to collapse a false binary between the human concerns and nature. Morton, builds on this in *The Ecological Thought* that also rejects this bifurcation.

[12] The theory of ozone destruction was published by Molina et al.

[13] See Simpson.

[14] See Gabrys; Bratton et al.

[15] See Fazekas for discussion of differences in species definitions. Hull discusses how these uncertainties have led to the concept of reciprocal illumination in plant systematics. This concept acknowledges the multiple methods for classifying and naming species.

[16] Now discontinued, *The Human Project* was an example of data collection in lieu of political action. The project planned to address issues of health, urban design and inequality by collecting huge volumes of data from 10000 New Yorkers over 20 years.

[17] See Keller's biography of McClintock's life.

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