PLATFORM, APPLICATION, GRID: SYNTHETIC ECOLOGIES AND EVERYDAY SURVEILLANCE

By

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Abstract

This dissertation intervenes in the study of media ecosystems with the provocation that physical computing networks are, in fact, synthetic ecologies. This is not just an analogy, as these ecologies are built from the everyday rhythms and events of user engagement across time and space. My central question is, how do contemporary digital infrastructures tie production to consumption, pecuniary value to sociality, and captivation to open systems? My research utilizes a semio-material analyses from science and technology studies as the bedrock of my methodological approach to these digital systems. This dissertation juxtaposes a discursive analysis of the visual, linguistic and procedural rhetoric of digital ecosystems with more phenomenological, performative and material investigations. By zooming in to particular social networks, videogame productions, and physical computing infrastructures, my research shows how daily events, rhythms and moments of production are responsible for the building of these synthetic ecologies. This is important, because it shows that intervening and improvising within digital ecosystems requires a shift to temporal and spatial scales that are thoroughly nonhuman. My research concludes that the daily monitoring and control endemic to synthetic ecologies problematizes an understanding of technology that is 'prosthetic' – or added to – human embodiment. Surveillance then becomes insufficient as an explanation for how these various systems function, because there are no "eyes" or "I" in the ecosystem. As we enter a new era of digital everydayness, where partially-visible infrastructures meter and monitor our here and now, my research evidences that an ecological approach to our study of digital media is essential for understanding the practices that synthesize 'unsustainable', 'closed', and 'dumb' social and ecological futures through rhetorics of 'sustainability,' 'play,' 'openness,' and 'intelligence'.

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Introduction: Everyday Surveillance in Synthetic Ecologies

Smart parking applications are platform-based services that users access on their smart phones in order to rapidly select and purchase parking in locations affiliated with those providers. Pay-by-phone parking services have been around for over 20 years, since the establishment of M-Parking in Zagreb, Croatia in 2001 by the telecom Vipnet (Terterov 2005). The ease and fluidity of pay-by-phone services – which originally used SMS to transmit codes for payment, become system-wide design parameters in the move to "smart parking." Smart parking services offer greater overall efficiency for those utilizing this networked system. On the one hand, users can access, monitor and even reserve their parking spots in advance, while local parking departments can rapidly scan and ticket vehicles for infractions and streamline operations (i.e. downsize, simplify). On the other hand, digital application managers can remain flexible to changes in the industry and customer habits through massive data collection which in turn can benefit larger platforms and holding companies. For example, suppose that due to some unforeseeable tragedy of a favorite micro-brewery relocating in a block close to public transportation, a city begins to lose revenue for a large quadrant of parking meters and in turn lack resources to monitor the newly-trending district. With a large enough grid in place, smart parking services allow mobile users to access these spaces dynamically while remaining locatable for the extraction of fines and fees for a municipality. This flexibility and rapidity is foregrounded in the headline atop ParkMobile's website: "Park. Pay. Go." Here, the app nestles into your daily routine, as one brief stop amidst users' mobility. Yet so much is collapsed in that middle term "pay," when a municipality, private business, or a public university contracts to use ParkMobile's platform. Starting in 2021, the University of California, Davis did just that –

linking together physical space with student and staff vehicles, smart phones, applications and private data, parking regulation staff habits and monitoring technologies, and campus commitments to future sustainable design. The number of things brought together and collapsed into a parking app certainly exceeds what I have listed here, but this new interaction is a synthetic one – it opens up new opportunities in this designed ecology of interaction.

Synthetic ecology is a phrase culled from the field of design (Waldheim 2014) that here articulates the dynamic circulation of bodies and desires, information and affects, digital assets and physical energies, hardware technologies and user practices all linked together across digital information systems. As a metaphor, synthetic ecology is helpful for interpreting the complex web of association and exchange, critiquing the equivalences naturalized by systems designers, and disentangling particular systems whose rhetorical performance is different from material operations. In short, while it is messy to speak with the language of ecology, the term helps to situate us amidst systems which are planetary in scale, and better recognized through their movements, interactions and affectivity than in individual components. But I want to push a step further. In the introduction to the edited collection *Your Computer is on Fire,* Thomas Mullaney defends the position that your computer is "literally" on fire; while fire metaphorically signals crisis, and spreads if left unchecked, computers interject as physical, material and metabolic machines that are responsible for a chunk of global energy use (2021, 5-7). I want to follow this sense of urgency cultivated by Mullaney and his contributors, and suggest that while it is wrong to render equivalent computational systems with ecosystems, it is no longer responsible to articulate human and "natural" ecologies as categorically separate environs. If one could snap their fingers and remove all humans from the planet, abiotic and biotic cycles and bodies across the globe would remain in-relation to the plastics, pollutants, heat and disruption to food webs

accelerated and facilitated by computational technology. If my reader bristles at the situating of ParkMobile in relation to ecology, then perhaps consider this a prolonged thought experiment in adopting language to render strange, instead of naturalize, digital relations. Using examples as disparate as smart meters, personality apps, and videogame platforms I argue that the physical computing infrastructures wedded to contemporary living are better understood through the concept of synthetic ecologies. In order to see the entanglement of promise and surveillance that these relations proffer, they must be traced from the actions and experiences of users that construct, utilize and maintain them through daily practice. This is important, because while corporate and state bureaucracies tend to advocate for consumptive, neoliberal responses to planetary crises (e.g. utilize these digital applications to mitigate peak energy hours; buy a Hydroflask to save on plastic; eat this, not that, meat, etc.), the scales for responding to these ecological asymmetries are already weighted by the everyday performance of systems. In short, digital practices often synthesize 'unsustainable', 'closed', and 'dumb' social and ecological futures through rhetorics of 'sustainability,' 'play,' 'openness,' and 'intelligence'.

Networks for interrelating bodies, energies and environments are reinforced through both signs and systems, as signification interacts with material, and structural changes. In John Law's "Material Semiotics," the author traces the different traditions and sets of methods that can be broadly construed as "semio-material" movements within the study of science and technology (2019). Pulling from a retrospective of STS scholars such as Michael Callon, Annemarie Mol, Bruno Latour and Donna Haraway, Law argues that social practices, "are simultaneously semiotic (because they are relational, and/or they carry meanings) and material (because they are about the physical stuff caught up and shaped in those relations)" (1). The author explains that these heterogeneous elements are linked together into webs, or networks, that he cautions can in

turn be limited by the very metaphors under consideration (3). An amalgam of technics and tools, human and nonhuman actors, alongside architectures, words and forces can be grouped under a particular heading, and in turn misunderstood, or advanced to propagate a particular metaphor over and against the empirical or situated evidence of a particular study. There might be strengths (or agendas) in conceiving of semiotic and material elements networks as a weave in one instance or as a market in another; for Law, a focus on case studies and situated examples helps us see that "*theory and the empirical cannot be levered apart*" (2, emphasis his). What is important to a semio-material approach is ultimately that it forces us to foreground the practices and movements involved in particular socio-technical arrangements (15). Adding to Law's approach, is the need that we understand our perspective as always coming from somewhere. Despite the persistent incorporeal rhetoric of clouds, information eras and digital epistemes, interaction is never disembodied from its situation. An attempt to achieve something like embodied objectivity or understanding, at least in the sense advanced by Donna Haraway, means that our knowledge will always be situated, and positionality is always tied up in relations of power (1988). Our choice of where to draw the boundaries, or how to articulate the numerous architectures of digital circulation is necessarily limited, and will always require modification; as Haraway reminds us, "translation is always interpretive, critical, and partial" (589). As I trace my understanding of synthetic ecology through both discursive and in material examples, I attempt to provide a situated perspective of knowledge about these small interactions, while zooming out to larger systemic problems.

It is often amidst a collapse in smoothly-functioning systems where the more processual elements of an ecosystem come into focus.[1] When computational system fails, for example, all of

[1] When a keystone predator is removed from an environment – like Yellowstone National park in the first half of the 20th century – everything from rodent populations to the shape of rivers changed; reintroducing the species in the

the labor, physical space, energies and nested layers of technology and bodies necessary for operating and maintaining systems start to present themselves. In a lecture entitled "MoMA and the Collapse of Things," Fernando Domínguez Rubio depicts museums as machines for stabilizing art as an object, arguing, "Ecologies specify objects." (2013) Drawing examples from multiple media, Domínguez Rubio reads artworks as slow events; that is, they are materials drifting away from aesthetic fixity and objecthood. Artworks require niche environments conducive to their preservation, which is why a museum's infrastructural (i.e. temperature, atmospheric, lighting, etc.) budget is second to only acquisitions in size. These distinguished cultural artifacts only remain art objects insofar as climate control systems can preserve their materiality within a Goldilocks zone. Dominguez Rubio's analysis here offers the material as an important component in analysis without resorting to something like object-oriented ontology. "What is needed", he argues, "is to develop explanations that are able to capture this "material unfolding of culture" as a bottom-up process that emerges through diverse configurations of people, meanings, practices, *and materials*." (2016, p.642) This imbrication of material and environmental factors is helpful to see in reverse. Yes, ecologies do specify objects, but certain objects or bodies serve as our primary interface with our lived environments, and in some cases are the only clue to ruptures occurring in much larger spheres of relation.

On April 14, 2021 all UC Davis students and staff received an email that there was a possible cyber-security incident that affected ParkMobile users [Figure 1]. I had heard about the security breach 2 days earlier from infosec website KrebsonSecurity, which discovered and publicized the results upon learning that at the end of March, the data had gone up for sale on a

90s led to a range of dynamic system changes (Anders). Wolves culled the large elk population, which had often damaged the young aspens and willow along river banks, increasing soil erosion and disturbing beaver populations; with fewer elk, the fragile soil was kept more intact and along with beaver's dams kept the rivers largely to course.

Russian-language, dark-web site. The scant information provided to UC Davis users didn't reveal what had been stolen (e.g. names, license plate numbers, email addresses, phone numbers, passwords and in some case physical addresses), how the data was acquired (i.e. through a third-party software vulnerability), nor how long ago the breach had occurred (Krebs 2021). It is worth noting that breached data sets like this typically go up for sale after a period of extraction, and that the publication of data on criminal forums is often the first signal to the platform owner that a breach had even occurred.[2] ParkMobile's investigation determined that no credit-cards had been accessed, nor had user movements or parking data, through GIS applications (i.e. Geographic Information Systems like GPS), and that users should simply change their passwords – with the paternalistic reminder that they should "always [use] unique passwords" (Member Services 2021). Not only did ParkMobile indicate that there was nothing substantial that users of the app could do, but any blame was to be placed outside of the service provider's application (i.e. hackers, third-parties, users who recycle passwords). Twenty-one million users were affected in the breach, and many of them will never know that were affected due to the various ways the service provider operates.[3] For weeks I casually questioned colleagues and students at UC Davis, and was surprised by how many remained ignorant of, or apathetic to, the breach.

[2] In fact, this is one of the reasons that zero day exploits are so profitable for hackers. Because they are unknown to the platform, server, or software operator, their intrusion value is literally to-be-determined. A zero day exploit on my home computer network is probably only measurable in thousands of dollars. But Equifax? Un-quantifiable.

[3] ParkMobile is just one of the names that their 'smart parking' service is utilized by, and many of those who park in their system do so at kiosks that require license plate numbers and not an account. A footnote under the security update reveals the number of differently-labeled apps and locations that utilize their services: "**City/operator branded white-label apps include Go Mobile PGH, Park Columbus, meterUp, MPLS Parking, Park Houston, ParkLouie, MKE Park, FW Park, Park It Charlotte, ParkNYC, 717 Parking, Park 915, and Premier Parking*" (Member Services 2021). While 21 million is relatively small considering the size of so many data breaches – Equifax, for example, affected 127 million in September 2017 and included social security numbers, addresses and birthdates – but it's emblematic of the precarity of users in relation to systems that they have no choice but to use.

POTENTIAL CYBER-SECURITY INCIDENT FOR PARKMOBILE USERS

April 14, 2021 -- IT was made aware of a data cyber-security incident that may have potentially exposed the data of UC Davis ParkMobile users, the pay-by-phone parking app. We take this threat seriously and are closely monitoring the situation. We will release more information as it becomes available.

In the meantime, we recommend that all registered ParkMobile users change their passwords for security.

Figure 1: Email from University about Security Breach

You have been hacked! In 2017, this was my provocative assertion to a conference of surveillance studies experts, as I attempted to conjure the affects that I thought befit the scale of the 1.37 **billion** user breach from River City Media the previous year (Ragan 2017). I was trying to articulate the strange mix of apathy and paranoia that accompanied the reporting on, and propagation of, security discourse in the infosec community. Contagion. Corruption. Infection. Assault. Or, alternately: Purity. Preparation. Protection. Safety. The language does much to charge the atmosphere around information security, enacting the securitized subject: one who has all the responsibility for inoculating against the potential intrusions, without any of the support. Everything about networked systems is promiscuously entangled, but securitization mitigates the dangerous flows by making the individual into a personally responsible, individual target at every step of the way. As Tung Hui-Hu articulates in *A Prehistory of the Cloud:*

> "The perfect network is where everything is connected and the network is omnipresent; "network fever" afflicts military planners and media scholars alike. This fantasy of the universal network has, at its core, the principle of deviance: of having a break or a rot somewhere in the network, of having circuits – or people – that are unreliable and untrustworthy, of not being able to know for sure "where it goes," or who is breaking it." (2015, 18-19)

In other words, paranoia is an epistemological disposition, or a propensity of networked knowing: it is habitually cultivated by techno-cultural practices and something from which we must protect ourselves. The material, and projective imaginary of this particular "infobiotic" milieu is literally laying the cable for both its propagation and that of its future pathogens. While Hu articulates this connection between paranoia and networked knowledge, I want to divert focus from this more militarized affect to the recurrent apathy. Because the collective shrugs that accompany ParkMobile's 21-million, or for that matter RCM's 1.4-billion breach, are remarkable only for their banality. Outside of the brand recognition of a Facebook or Apple, data breaches don't seem exceptional, and in fact they signal the ways in which our lifecycles are differently-inflected by the synthetic ecologies we each exist across. Breaches echo through a wild west of data collection that require a shift of standpoint to the everyday, lived environment.

The everyday, as a category of thought, is one tuned to the rhythms of bodies circulating through space and time. ParkMobile is woven into the daily lives of students and staff users whose first moment on campus is marked by finding a space, pressing the app and accepting charges for the day. The particular bounds of the everyday, seen in Michel De Certeau poetic description of 'two cities' in *The Practice of Everyday Life*, is always a matter of situated perspective (1984). On the one hand we have the "panorama-city" a conceptual image designed in concrete and steel and visible from the top of New York's skyscrapers – the realm of city planners and platform designers. On the other hand, we have a view from below, a "chorus of

idle footsteps" that stitches together a city through practice, through walking (92-102). De Certeau uses the figure of speech 'asyndeton' as the syntax of those cycling through space, a lived-perceptual relation that selects out only those points of access in an environment which we repeat across time (101). These are those who *Park, Pay, Go*. The voyeurs versus the wandersmänners is one of innumerable relations created through the many synthetic ecologies like ParkMobile, as those moving by electric scooter, bus, bike, or on foot are not privy to the same movements, tempos or perspectives on campus space. They are inflected through numerous crossings of bodies and distributed across time, but their interaction is not rhythmed in the same manner. Henri Lefebvre and Christine Levich tie together these overlapping series of the everyday with the addition of those repetitions that signal the banality of capitalism, saying, "The everyday implies on the one hand cycles, nights and days, seasons and harvests, activity and rest, hunger and satisfaction, desire and its fulfillment, life and death, and it implies on the other hand the repetitive gestures of work and consumption" (1987, 10). For Lefebvre and Levich, the concern is on the structures of consumption in modernity that distract from a shared everyday, and emphasize passivity on the part of the working class. I bring them up here to focus on how ParkMobile offers a cyclical relation to the lived environment that changes depending on days weeks, quarters and seasons, all the while adding in rhythms that exist outside of the user's purview. These cycles of consumption and unseen work operate below the application layer. Furthermore, this repetition of operations occurs at scales of time and space not always localized to the dureé of the user, creating a here and now unable to respond to here and now.

This spatio-temporal disjuncture is key to understanding the collective apathy, along with the scale at which synthetic ecologies link spaces, bodies and energy. Human affectivity – what Mark Hansen terms our "bodily modalities of tactility, proprioception, memory and duration" –

struggles to apprehend the speeds and scales at which these systems operate (2001, 61). While Hansen is speaking to the need to resituate changes to photography amidst a dynamic "body-centered model of perception" (contra John Johnston's machinic vision), we have no disorienting image with these new ecologies of relation; instead we have an inhuman surfeit of data linked together across the space and time of a service platform, accessed through an application layer, arranged into a grid, and causing bodies to move about space differently (63). When commuters arrived back from Winter break in 2021, they found a parking landscape changed to meet the demands of the future; from there on out, ParkMobile was the only way for UC Davis students, faculty and staff to park on campus.

In 2019 UC Davis had released their campus planning brochure "Transportation Tomorrow," which called for "greater mobility and connectivity for the Davis campus," and outlined upcoming changes to campus in the next decade. Within these speculative plans, the prediction of doubling the students on campus by 2030 serves as the metric for imagining these intersecting space and mobility needs into a transportation "network" with "sustainability" as its central value (1, 2, 3, 5, 7, 8, 12, 13, 14).[4] When and where ParkMobile's (i.e. its affiliate's) distributed border was breached will never be known by users because ParkMobile is both "here, but not here." These delocalized information topologies, create topographies of relation that are hostile to the everyday lives of users.[5] User shrug in resignation for the simple reason that cycles

[4] This imagined future is positioned as requiring changes to parking fees, app-based service providers, and License Plate Readers in order to 'streamline' the process, make the system more 'efficient' and 'flexible', and improve safety and 'flow' (Transportation Services). The financial concerns the play a part in institutional changes are not to be scoffed at. While the UC system has good data on the Covid-related loss of revenue from housing services and meal plans (431.4 million in the first half of 2020), sporting events (279.7 million) and classes (111.7 million), there is little data on parking as many of these departments generate their own operating budgets. But IF students and employees are paying approximately 3 dollars a day to park at one of their 11000 daily parking spots, and they dropped from 95% to 20% capacity during the first half of 2020, then they were losing almost 25 thousand dollars a day (University of California) (UCD Transportation Services) (ParkMobile).

[5] The sentiment expressed in the phrase "*if you have nothing to hide, you have nothing to fear*" – from the NSA, FBI, DEA, CIA or the innumerable other acronyms for invisible intergovernmental forces of policing that may or

of living have been captured within distributed ecosystems that then must form our primary interfaces to space and time here and now. We get access to these spaces through being accessible, but our serial engagements render us passive to these synthetic ecologies that transect us beyond the scales of human temporality.

Everydayness is a concept in surveillance studies that has accompanied the widespread adoption of the internet and its increasing financialization. While pre-internet and even pre-electronic media prefigure this massive documentation, storage and processing of individual data, we see a qualitative transformation of this information in the networked, big data future. In his early writing on everyday surveillance, David Lyon argues that we shouldn't construe the routinized collection and classification of data as sinister, but as a situated necessity for the administrative purposes of larger bureaucracies (2002, 243-4). Instead of focusing on threats to privacy, Lyon argues, we should see the ways in which these everyday collection tools become perpetuated a means of governance, and get deployed to reinforce social difference (249). That our systems of classification and sorting could be used to govern, one only has to look at Michel Foucault's oevre on the histories of scientific, sexual, medical and criminal architectures. Social difference too is embodied in the everyday surveillance practices, which while often instantiated

may not be watching you – begins to calcify into policy in the wake of something like the Cybersecurity Information Sharing Act (CISA) which received bipartisan support and was signed into law by President Obama on December 18, 2014. The bill's primary provisions are to allow companies, who maintain or traffic in information systems, to monitor the activity of users on their sites, deploy countermeasures against determined threats and share the information about the users to government actors with impunity. Furthermore, due to the covert nature of the "monitoring" and an inter-departmental milieu built to facilitate both corporate and governmental sharing, the breadth and depth of the surveillance is essentially unknown, or "to be determined" and free from redress through the Freedom of Information Act (Section 104 (4)(B)(ii)). Shifting the legal terrain, away from the website and corporate server, and towards your private network, personal computer, or connected device, makes you the strategic ground for countermeasures by undisclosed Infosec (information security) operatives. Consequently, the re-formations of desire put back into production, and the affects mobilized to support (through apathy or consumption) discourses of cyberthreat-and-security are not exactly biological or skin bound, although they are sold that way. That said, this distribution of networked presence, under proxies of the human, might help us think of other paths for desire and conduits for care enabled by a paranoiac, or an apathetic user position. If, for example, we are working with or interviewing precarious users, we can serve as a vector for state or corporate surveillance, or its obfuscation.

in order to provide a genuine benefit through a measure of efficiency, pattern recognition or other visibility, "tends to deflect attention away from the inequities associated with" its function and implementation (254). Sean P. Hier hammers home this point when arguing that these new assemblages of surveillance networks and capacities for data gathering are not random in their extension nor categorically unique to the present moment (2003, 403). While Hier acknowledges the distributed and rhizomatic character to the massive conglomeration of surveillance practices outlined in Hagerty and Erricson (2000), the distribution of surveillance for social control and sorting has never been a homogenous practice. Hier notes how the perhaps-laudable attempts to "stamp out fraud" and verify information on welfare recipient programs, led to denial of services, increased social surveillance and even the threat of bodily harm for already-precarious lives who had to contact abusive ex-partners or collect documentation they never needed in order to measure up to the new digital systems (2003, 408). Simone Browne's work on the surveillance of blackness (2015), or Virginia Eubanks research on the automation of income-based health and social programs (2018), further reinforce this sense that everyday surveillance exacerbates social difference and inequitable governance.

The everydayness of the monitoring, collection and processing is a central value of digital systems that attempt to map to physical layers of human living. They hum alongside daily practices of working, moving, playing, browsing and being in ways that are unobtrusive, and increasingly insensible. Consider, for a moment, the extraordinary circulations these systems are waiting in the wings to reveal: *How many calories have I burned, how many steps have I taken, how many beats per minute is my resting heartrate? How long until I need to move my car, how long until my food arrives, how much time will be added by taking this route? What was my home's energy consumption at 5pm yesterday, how many watts is my solar array currently*

producing, what is my buyback contribution to the energy grid? What can my browsing reveal about my personality, political affiliations, desires and consumption history? Even, how does the world look, how can I change my environment, and what is happening that I can't see? These layers and levels of everyday value which affect our perceptions of body, mind, temporality, space, energy transfer/consumption, aesthetics and agency are startling. In the case of a smart parking service application, value is not just accrued for the company (ParkMobile), or its larger platforms and conglomerates (i.e. EasyPark Group, Vitruvian Partners, Verdane Capital, BMW, Daimler). Users too receive the added convenience of paying cheaper fees, accessing space on the days that they need, and changing behavioral patterns to fit lifestyle choices and schedules, while local parking managers (e.g. UC Davis Transportation services) are able to manage budget shortfalls amidst a dynamic transportation environment rendered more chaotic amidst the pandemic.[6] These are no small benefits. For systems that seem so exceptional in their overreach, with capacities to classify and divide up the social body in inequitable ways, it's worth reminding ourselves that they are built in the everyday. Infrastructure is one word for what these digital systems look like from the perspective of system's designers and platform owners. Like De Certeau's planned city, they require the shifting perspectives attuned to varying scales of the local, municipal, national and global. Synthetic ecology, however, reminds us that the systems

[6] During a private exchange with Ramon Zavala, the Transportation Demand Manager at UC Davis' Transportation and Parking Services, he said that, "at our core, Transportation Services is a sustainability organization." He showed me the last 4 years of the operating budget of the transportation department, which is entirely self-funded and exists in a relationship that he says is "self-destructive" (i.e. it doesn't get tax revenue, institutional support, and it's required to allow fewer and fewer cars each year while paying off previous-generation's parking structures). The budget gap was frankly astounding. You hear about the shortfalls in the hypothetical register – "across the UC system," but to see a department lose 6.7 million dollars in a single year is significant (2020-21). His closing comment about the future plans of the department was indicative of the ecological scope that ParkMobile helps to synthesize: "Discovering a fiscal-ecological balance (aka, getting out of a multi-million dollar structure deficit) while not simply green-washing our efforts post-pandemic is our next task."

get built in the walking, through the circulation of bodies, energies and information across space and time. And unlike De Certeau's city, they are not always for the human.

Here we might interject the work of Ben Bratton, who positions "The Stack" as both a new model of geopolitical architecture and the technologies building this geography. A strange recursion can be seen in Bratton's work, as he argues, "these technologies align, layer by layer, into something like a vast, if also incomplete, pervasive, if also irregular, software and hardware stack…it is a machine that serves as a schema as much as it is a schema of machines (131). By focusing on speculative and utopian megastructures from the 20th century, Bratton is able to highlight these planetary-level architectures that, while never built, exemplified the combination of envelop and apparatus that can be seen in his contemporary geopolitical model (152-4). Importantly for Bratton, the six interdependent layers – earth, cloud, city, address, interface, user – are always porous borders and interfaces through which users can be construed as political subjects:

> "Platform sovereignty can be a function of how a border or interface addresses one or many *Users* and their interlocking relationships, while the *City* layer's physical and virtual interfaces and its architectural edges and envelopes can be equally decisive in their governing methods" (145).

As both systems of figuration, and literal structures that envelop and constitute users, the layers of the stack carry both the utopian aspiration of designers wanting to manage complex environments and the dystopic possibilities that accompany the expansive data collection needed to provide this macroscopic image. It is here, interestingly, that Bratton inserts the phrase "synthetic ecologies" to name the architectural design that cites the planetary-scale realities of the Anthropocene, in order to respond to the management and energy needs at the level of the building or address (157). Bratton concludes by arguing that the scale needed for design is not

the megastructure, but the "Copernican conceptual recalibration" that our planet itself is the territory upon which we must imagine and experiment (158). Ultimately, he arrives at the ephemerality and openness of atmospheric metaphors, noting that "architecture" is actually, "the wrong metaphor for architectural thinking" because of its connection to measurement and property (159). This appeal to remain open to a future we can't anticipate is a sentiment I share, and one I think arrives in fits and spurts in the synthetic ecologies I trace in this dissertation. While Bratton remains focused on the scope of design and infrastructure at various levels of the stack, synthetic ecologies are already functioning at all and perhaps none of these levels, often outside the borders of human consciousness and addressability. My argument, instead, is concerned with the practices and everyday use that bring together and synthesize these ecologies.

For the remainder of this chapter, I do two things. Towards the end, I outline the three subsequent chapters, and articulate some elements that draw them together. In all of them, my reader will note conceptual threads that run throughout: a tracing of the language and promise of the technologies from the design-side, a focus on the development and implementation of these digital systems, and an attention to the practices and implications for users synthesizing lived environments through engagement. In all of this I attempt to highlight not the monolithic structures, but the asymmetries of power and strange relations required for users to respond differently at the scale of synthetic ecologies. But first, in order to showcase some of the semiotic layers and material practices that have found their way into the use of these overdetermined words, I work through some of the conceptual genealogies of 'ecology' and 'synthesis.' By genealogy, I'm not attempting to showcase linear development, but instead citing the practice in media archaeology of examining technologies across historical contexts (Huhtamo and Parikka

2011; Gitelman 2006; Kittler 1999).[7] In tracing this selective genealogy, I want to call attention to the redundancy in the concept of synthetic ecology. Since its instantiation, ecology has been a way of bringing together and synthesizing separate elements into a system (i.e. in biology, business, media studies). Synthesis too has often become a way of thinking through and even systematizing new worlds (i.e. in aesthetics, chemistry, social science or environmental design).

While certainly there are all manner of problems in utilizing "natural" or environmental language, there are two notable risks when speaking of synthetic ecologies that I have foregrounded below. The first pitfall we must avoid is the problem of accepting uncritically the language perpetuated by platform owners, social network operators, and the designers of machine-to-machine technologies.[8] Facebook, Google, Amazon, Microsoft, Apple – these companies all regularly use the language of ecosystems to naturalize their products. Language often does a lot of work to establish a frame of reference or even belief about a particular product, system or relationship. While J.L. Austin might distinguish performative language from more denotative statements in his text, in truth the mere act of referral has illocutionary force (Austin 1962, 98). Control over language is a component of juridical power, and we can see that most relations with contemporary technological platforms, apps and networks are mitigated through end user license agreements (see footnote 4). Here, a simple switch of language can have dramatic effects on cost, privacy or risk to the user. Wouldn't it be better to speak of platforms

[7] I'm quite aware of media archaeology's indebtedness to Foucault's (and Nietzsche's) genealogy, but by not foregrounding his discursive project here, I'm trying to shift attention towards the way these ideas get instantiated in material/technological design and practices along with not-so-ecological interpretations. For more on this history of collapsing biological and technological systems, see N. Katherine Hayles *How We Became Posthuman* (1999).
[8] The language of business ecosystems, now incredibly commonplace, is part of this long history of collapsing ecology or economy into one another due to etymological similarities. Nearly 100 hundred years after E. Ray Lankester coined the term, Michael Rothschild used the neologism "bionomics" to champion the free market as the financial expression of underlying evolutionary teleology in *Bionomics: Economy as Business Ecosystem* (1990). While just one example in a lineage of organicism, Rothschild evidences this corporate tendency to naturalize a discourse through environmental analogies (i.e. free market ideology is to economy as natural selection is to ecosystem).

through the language of publishers, rentiers or markets? Would that provide more critical distance? I think there are strengths to this approach, but choose to maintain language close to that of Silicon Valley elites for the simple fact that I take seriously what they say they are doing. They believe they are creating new digital worlds, and utilizing their language helps to take seriously the affects and effects to which they are actively committed. Furthermore, using language co-opted by a dominant ideology isn't acquiescence to its meanings. Taking language seriously means juxtaposing these digital environments alongside traditional ecosystems now in flux, and often destabilized through the extraction, combustion and synthesis of new elements. To avoid this pitfall, I will emphasize the conflicting language and performance from stakeholders, designers, states and users. This brings us to perhaps a connected problem, insofar as scientific language and natural metaphors are made to structure thinking about a subject or systems.

A second pitfall, and one endemic to the advances of science and technology for literally hundreds of years, is the bleed of scientific language and metaphors into fields that are not directly connected. Here we run the risk of continuing the same naturalist fantasies seen much earlier in evolutionary economics, waves of cybernetics, and human-computer interaction. This problem goes to the center of my project, because it is my argument that synthetic ecologies are the best way to understand the circulation of affect, energy and identity across the geographical and digital milieu. It is not my desire to render equivalent synthetic ecologies with extant habitats, so the reader won't find uncritical adoption of the language of predators and prey, flora and fauna and so on; that said, I increasingly see information infrastructures as the critical piece in the circulation of a/biotic elements in digital and natural environments. As above, the trick is to situate language proportionally so that we can see both where natural/social or eco/info

components are commensurate, and where the metaphor breaks down. These break-downs can be fertile moments for analysis, but if advanced uncritically, we run the risk of legitimating social fantasies with science, or even worse, reading natural ecologies as computational ones. Herbert Spencer is guilty of the former with his social Darwinism, as he both misreads and then appropriates Darwin's natural selection into a justification for economic and social disparities.[9] Alternately, the latter can be seen in what N. Katherine Hayles outlines in cybernetics as "first-order cybernetics," which from the 1940's-1960's was concerned with, "subverting the boundary separating biological organisms and machines" (2010, 149). Both tendencies are not just about a semiotic performance, but a failure of 'fitness' – to co-opt Spencer's language. The failure of a metaphor to fit or to hold, often reduces the explanatory usefulness on the one hand while also opening to the possibility it will advance illegitimate or pseudoscientific ideas on the other.

Ecology

My use of the word ecology (**oikos** [*house/dwelling/habitation*] + **logos** [*word/plan/discourse*]) hails a 150 year-long conceptual trajectory that, while originating in the natural sciences, increasingly has purchase in fields as far removed as information sciences, social sciences, business and economics, the humanities, and design and engineering programs.

[9] The naturalizing of economic behavior, conversely, finds its aphorism in Herbert Spencer's *The Principles of Biology,* where he coins his now infamous phrase – "the survival of the fittest," (1864, 444-5). Spencer's ideas were so popular within the Victorian context, that Darwin was persuaded to add it to his 5th edition of *On the Origin of the Species by Means of Natural Selection* (Wallace). Not incidentally, Spencer like Haeckel, reads Charles Darwin's natural selection into a Lamarckian lineage.[9] The phrase, which he extends to racial typologies that reinforce civilized versus savage man, is an early index of this trend to root economic or aesthetic conditions in biological mechanisms (Spencer, 455). Furthermore, Spencer's work, like so many others in this moment of expansion in the biological sciences, exemplifies the synthesis of biological analogy with human programs. In other words, Spencer's aphorism is a heuristic device which couches political and economic strength as biologically-founded not in a species, but in successful individuals. This shouldn't be surprising, as Spencer's *Principles* is one piece in his much larger work *A System of Synthetic Philosophy*, which attempts to synthesize philosophy, physics, biology, psychology, sociology and ethics.

The word 'oecology' was coined by zoologist Ernst Haeckel in his *Generelle Morphologie* in 1866: "By ecology, we mean the whole science of the relations of the organism to the environment including, in the broad sense, all the "conditions of existence" (Stauffer 1957, 140). According to Elizabeth Watts et al., it was Haeckel's understanding that to study an organism's morphology, physiology and environment you must look to the interaction betwixt these not-so-discreet elements that shifted the biological paradigm (2019: 681).[10] Much of Haeckel's work has fallen out of favor – such as his theory that ontogeny recapitulates phylogeny (e.g. his notorious embryo drawings), his support of scientific racism (e.g. stem trees of evolutionary descent that show racial hierarchies) and accompanying ideas about eugenics that were used as justification by Nazi race hygienists (Richards 2008, 504). I bring these histories up, not to anachronistically hold Haeckel to our contemporary ethics, but to note the historical confluence of these models of the world and the solutions or programs that are developed from an abstraction of good management. Haeckel viewed ecology as a component under zoology along with 'chorologie' or what we might call biogeography; and his footnotes indicate the association with the Greek root oikos - housekeeping/household relations was in mind – a root that also, importantly, is selfsame to that of the word economy (Stauffer, 140).[11]

[10] "The idea of integrating research from developmental biology and ecology into evolutionary science, which gave rise to the field of eco-evo-devo [i.e. ecological evolutionary developmental biology], is Haeckelian in nature as it is fully in-line with Haeckel's initial intention of fusing development, ecology, and evolution within a single conceptual space" (Watts, 683). One instance of this interplay could be seen in how phenotypes have been shown to be both genomic dependent and reliant upon environmental factors as well (Ibid.).

[11] Despite his credit for the neologism, most of the substance of Haeckel's oecology can be found earlier in the work of Charles Darwin. Robert Stauffer shows that the Darwinian concepts of natural selection combined with the struggle for existence in a given environment, evidence an early understanding of ecological interrelation. Specifically, it is Darwin's concept of the "oeconomy," or alternately "polity" of nature, that informs Haeckel's understanding of ecology: "for us all organic being are striving…to seize on each place in the economy of nature, if any one species does not become modified and improved in a corresponding degree with its competitors, it will soon be exterminated" (Darwin in Stauffer, 139). In Darwin's theory of natural selection, there is a given economics or even sociology (i.e. polity) to the natural environment that is open to a variety of occupants adapted to these conditions (140). But like a zero-sum game, this economy of natural systems renders some beneficiaries, and others evolutionarily bankrupt. While I don't go into detail here, it was the limits set by the "precious commodity" of food supply, articulated through Charles Elton's concept of food webs, that provided nature's economic limit. Sean

The zoologist E. Ray Lankester's neologism "bionomics" was his early term for ecological study that bridges the observations of populations in their natural habitats with breeding (1893: 13). Lankester work was similar to Spencer's fitness criteria, in that the observations of bionomics were combined with questions of teleology and inheritance.[12] What stands out about bionomics, and renders it helpful for understanding modern ecology, is its connection of physiology to environmental relationships at the scale of populations. Lankester's bionomics explicitly acknowledges the 19th century move out into the field that Darwin exemplified, through projects such as the building of marine biology stations (39), and the replicating of conditions of ecosystems in the laboratory and the zoo (47). Richard Barnett argues that Lankester's ensuing work on evolutionary degeneration, i.e. the gradual change of an organism in which it adapts to less varied or complex life – such as parasites, leads to a discarding of a "Spencerian interpretation of Darwinism" that saw wealth and power as guarantors of fitness (208). Lankester's disdain for eugenics, however, was not a rejection of the scientific management of the socio-political world (not to be confused with Taylor's scientific management), but as a program that was unscientific (219). With his friend H.G. Wells, Lankester saw education founded on inductive epistemology as a solution to the social degeneration they observed in both the aristocracy and the middle class (Barnett, 2006). Lankester framed his work in zoology as one long thread from Heraclitus (the first formulator of evolutionary doctrine in his mind) through Aristotle, Milton's cosmogeny, and the natural

Carroll: "How did animals regulate their numbers so that they avoided overpopulation on one hand, and extinction on the other? Elton suggested that, in general, increases in numbers were held in check by predators, pathogens, parasites, and food supply." Elton, incidentally, was influenced by assisting Julian Huxley's work, which following E. Ray Lankester, bridged Darwinian selection with population studies.

[12] "Darwin may be said to have founded the science of bionomics, and at the same time to have given new stimulus and new direction to Morphography, Physiology, and Plasmology, by uniting them as contributories to one common biological doctrine – the doctrine of organic evolution – itself but a part of the wider doctrine of universal evolution based on the laws of physics and chemistry" (46-7).

philosophers of the 18th and 19th centuries who laid the groundwork for Darwin (Lankester, 53). At the fin de siècle, Lankester's argument that evolutionary biology and natural philosophy converge in a sort of apotheosis of evolutionary possibility is of interest here. Lankester argues that following "the derivation of man by natural processes from ape-like ancestors, and the consequent derivation of his mental and moral qualities by the operation of the struggle for existence and natural selection from the mental and moral qualities of animals," all philosophy now enters a new era with ensuing ramifications for the practice of history, sociology and psychology (54). This orientation in Lankester's bionomics, like much modern-day ecology, positions mankind at the border between research and design, observing at the scale of the ecosystem, and controlling the future through interventions and reforms.[13]

Media studies in particular has been inflected by the concept of 'media ecology', reflecting a concomitant focus on media as prostheses for extending sensibility, and as the horizon of the sensible. Neil Postman is the first to use the phrase "media ecology" in a public lecture in 1968, defining it as the "study of media environments," but reveals that McLuhan had privately used the term with him in years prior (Scolari, 205). Indeed, media ecology sums up much of McLuhan's scholarly and public-facing program as media technologies form the very

[13] In their literature review of business ecosystems, Mirva Peltoniemi and Elisa Vurori articulate the difficulty in extending analogies from the biological ecosystem, with its accompanying theories of complexity, adaptation and co-evolution, to the social sciences and economic systems. Despite their reservations, they define a business ecosystem as, "a dynamic structure which consists of an interconnected population of organization"; this interconnected structure, conjoined to the principles of self-organization, not-so-surprisingly requires laissez faire economic policies to function (2008, 13). Those businesses, however, who exemplify the business ecosystem – Alphabet, Meta, Amazon, etc., are in practice those who can control the flows of elements throughout their systems through prioritizing discreet returns, vertically manipulating supply chains, and horizontally eliminating/absorbing competitors. Business as ecosystem is an analogy full of promise and possibility due to the interactive image of the system, yet it should come as no surprise that they bear a striking resemblance to monopolies. Like Herbert Spencer's mistake of rendering social prosperity analogous to an organism's habitat fit, conceptualizing corporate entities as ecosystems allows us to imagine dominance and control as indicative of fitness or excellence. In all of these eco-examples – from Darwin's oeconomy of nature to Lankester's bionomics and the business ecosystem, we find not a collapse, but a synthesizing of meanings from disparate fields wherein particularity is rhetorically trimmed in order to arrive at something like natural law.

milieu of a human era. McLuhan's famous aphorism "The Medium is the Message" betrays this ecological inflection, as the human's relationship to communication media is a sort of habitat of enclosure in a historical moment. For McLuhan, we only grasp retrospectively the era of print once we enter into the electrical age; like Benjamin's dialectical image, it requires a gestalt for critical awareness (216).[14] In Carlos Scolari's estimation, this trend to conceptualize media technologies through ecological metaphors has resulted in two primary genealogies of media studies: that of media as environments, and media as species, which together have limited the possibilities of the fecund metaphor. What he proposes, is to utilize ecological metaphors with specificity in order to find descriptive models and formulate questions, while recognizing answers lay regularly outside of these analogies (218). A recent example of scholars using ecological metaphors to generate models for contemporary media ecosystems can be seen in Whitney Phillips and Ryan Milner's text *You Are Here,* which the authors hope will "encourage reflection about how deeply entwined we are with our world and with one another" (8). Phillips and Milner utilize the metaphor of a polluted ecosystem to examine how disinformation and toxicity spread across networks. A central concern of this text is to situate the contemporary moment against its larger history so that educators and students alike develop tools to address their polluted media landscapes.[15] Media ecology is useful for this recursive understanding of communication tools and the material and metaphors that interact with human sensibility, but it

[14] McLuhan's understanding of ecology is not exactly scientifically accurate, but where it can be found, he maintains this relationship of perceptual limits that maps quite nicely to von Uexküll's umwelt. New media, for McLuhan, have a force that overtakes the existing milieu, regardless of regressive tendencies or earlier media forms: "But all the conservatism in the world does not afford even a token resistance to the ecological sweep of the new electric media" (1994, 216). In fact, McLuhan even renders commensurate the ecological with the electrical age, placing the return to tribe and to nature as necessarily facilitated by electrical media (169-170).

[15] In analogizing information networks to atmospheric, biological and circulatory metaphors, the book attempts to offer a pedagogical response as intervention in the contemporary media ecology. While the authors are certainly aware of the backdrop of environmental disaster which is exacerbated by polluted information networks, the focus is almost entirely on human discourse networks.

largely remains stuck in a universalist sense of the effects of a communication's medium upon a homogenous human perceptual system.

The conceptual drift of ecology has accompanied its dissemination to the humanities, social sciences, and importantly, design and engineering practices. In general, environmental consciousness and accompanying systems-focused methodologies have promiscuously migrated into these disparate fields and disciplinary formations as little more than metaphor. And the metaphors flow both ways. Evolutionary biologist Kim Cuddington argues that metaphors like 'the balance of nature' have actually hindered the understanding of ecological models of mathematical equilibrium within the field due to the value-laden associations of balance (2001, 477). The metaphors that migrate in turn synthesize elements not meant to be commensurate. Conversely, as designers Nina-Marie Lister and Chris Reed trace these transdisciplinary genealogies, they argue that ecology "has been co-opted to refer to almost any set of generalized ideas about environment or process, rendering the term essentially meaningless." (2014, 23) These metaphors are typically accompanied by a closed system approach that envisions balance and control – two ecologically suspect terms – as central features (25). But ecosystems, and the habitats, abiotic circulations, biotic migrations and cycles of life, food webs, and energy transfers that comprise them are dynamic, and any "stability is patchy and scale-dependent." (26) Lister and Reed articulate the importance of software technologies as tools to visualize ecological systems and develop design interventions, but the reflexivity of those apparatuses that both model dynamic systems and propose to interface with system dynamics for design purposes misses how the interaction is a synthetic one (38). Interventions expand and contract through the interfaces which serve as both horizon and boundary for thinking and imagination.

Synthesis

The synthesis between early scientific research and the imagination can be seen clearly in German Romanticism, though the trend of instrumentalizing aesthetic tools certainly prefigures Boyle's experimental methods (See: Friedberg 2009). Esther Leslie's *Synthetic Worlds,* for one, examines chemical innovations from the late 18th through mid-20th century alongside the coeval changes in aesthetics and artistic production that accompany the explosion of new colors, textures and artificial chemicals (2006). In beginning her work at the outset of the industrial revolution in Germany, Leslie is able to chart the historical blend of Romantic aesthetics, technologies of production, and natural philosophies that were cogs in its functioning. Perhaps inherited from a mendicant contemplation of nature, this Romantic view of discovery, self – reflected in objects, displays a sensuousness strange to our conceptions of the detached scientist. "Through 'magical observation,' through the heightening of consciousness, the experimenter approaches the object and draws it into himself. Of this procedure [the poet] Novalis notes that nature 'reveals itself all the more completely through him, the more his constitution is in harmony with it'" (34). This confluence of science and desire, of subjects and their burgeoning objects, happened under the watch of Romantic natural philosophers. While Hegel might have decried the imaginative hermeneutic that was applied to the natural world, even his dialectic aligned with the work of Schelling, Goethe and others to imagine an original unity of poles, spectrums and forces that could be arrived at through experimentation with opposites (60-72). In their observations of the natural world, the Romantic experimenter searches for a synthetic world that is, in a sense, primary to the material itself. "For each part of nature a synthetic version was busy being found," Leslie argues, "in order to outstrip nature's charms, or, as in the case of colour chemistry and guano, in order to make up for the deficits in imperial-national natural

provision" (Leslie, 97). Synthesis here starts by copying the natural world, and becomes a way of designing the future one.

"Synthetic *world"* is a term used by Edward Castronova and others to point to the potential of conducting social science research in virtual game worlds.[16] An equivalence is drawn in their research between the petri dish -- which can separate bacteria from their milieu in order to isolate testable hypotheses -- and the synthetic videogame world, whose variety of control parameters allows one access to many previously untested social science questions (Castronova et al., 274-6). Castronova et al. argue that social-science research in synthetic worlds is unique in its ability to balance the internal and external validity of dynamics observed in the world (281). That is, control mechanisms create precise conditions and allow accurate measurement of the virtual world; these capacities, when combined with a database of information and longitudinal analysis of trends, permit "conclusions [to be] drawn about the behavioral tendencies of larger populations and social institutions" (284). Yet strict parameters for control, which give the experimenter the ability to monitor and tweak the responses of players, suggest a more apt analogy for the synthetic worlds would be the operant conditioning apparatuses developed by B.F. Skinner for social science research and behavioral modification (285-6). Yet the synthetic worlds Castronova et al. champion are too closed, static, or preexistent. This structural metaphor championed between the method of isolating out a bacteria *culture* and that of "synthesizing" a cultural phenomenon, reifies the Cartesian opposition that Henri Lefebvre railed against in *Production of Space:* "Blithely indifferent to the charge of circular thinking, [scientific]

[16] Are the terms "virtual" and "synthetic" commensurable in their article? The use of both terms points towards the utility of the worlds for experimentation, not some divide between virtual and real that you find in a lot of the literature at this time. See De Souza e Silva and Sutko (2001). I would take issue with the supposed ease of determining sex, race, family origin, culture and politics in their research (274), as the only access to those materials would be questionnaires and trust of the participants who are "logging in". But the confluence, and even 'bleed' between virtual/actual is a tendency Castronova et al. are tracing that I am taking as for granted in 2022.

discourse sets up an opposition between the status of space and the status of the 'subject', between the thinking 'I' and the object thought about" (Lefebvre, 4). I'm not interested here in discounting the capacity of synthetic worlds for social science research (quite the opposite!), but in complicating the terrain with the emergent synthetic realities of bodies in situ. A synthetic world remains a helpful way to label an individual experiment or individuated experience (e.g. the save file of a player's game, a homeowner's energy profile, etc.), but this "world" is one modular piece in much larger ecologies of interaction. Each artificial boundary is not a hard limit, but a point of contact for innumerable other worlds; these worlds communicate with each another through the very asignifying processes that enable user awareness through graphical, semiotic, and haptic inputs and outputs.

Synthesis, like ecology, is a word overdetermined by the various lineages from which it cites, and yet one that remains evocative due to its explanatory power for dynamic interaction.[17] When reading Murray Bookchin's *Our Synthetic Environment* (1962), the authors explicit wedding of synthetic interaction to environmentalism pulls the artificial into dialogue with a more cultural or associational understanding of synthesis. Murray's book predates Rachel Carlson's *Silent Spring* by a few months, and similarly highlights the implications to human and planetary health from the chemical industry. Murray argues that in medical research in the 20th century, synthetic or social causes to illness were largely viewed as pre-Pausterian regression by those looking for microbial causes to disease (16-17). The problem, Murray surmises, is complexity: if a solitary cause can't determine all the cases of a particular illness, "researchers

[17] The conflict of difference that sets the engine of synthesis in motion can be seen clearly in Sergei Eisenstein's dialectical approach to film. While grounded in Hegel's dialectical philosophy, and in Marx's historical materialism, Eisenstein's aesthetics of conflict places everything from light and space, tempo and graphics into a formal system of conflict (1977, 54). The artificial, and associational aspects of synthesis comes through in Eisenstein as well, most clearly in the case of certain overtonal montages, which he says can arise in situations which are "wholly a-dominant," producing psycho-physiological vibrations that seem built out of sensuality, not conflict (68-9). But like so many others, interaction gets reduced to conflict.

are inclined to distrust the constellation as a whole" (27). The text never defines synthetic, it just progresses with the conviction (and evidence) that the environment is a dynamic system of interaction, and that humans are engaged in a process of transformation that could well be different, or less irrational than the currently state of affairs (236). Murray's refusal to return to a romantic, or pre-techno-scientific, relationship with nature speaks of a program that wants to collapse the distance between synthetic and natural: "The two spheres, natural and synthetic, must be brought into a complementary relationship based on a clear understanding of man's needs as an animal organism and the effects of his behavior on the natural world" (311). Despite Murray's anthropocentrism, this fiercely practical relationship to environmentalism that understands human action, design and research as inextricably connected to nature is helpful.[18] In the end, however, my understanding of synthesis differs in that Murray's reflexive pragmatism with regards to human action is built out of a field of conflict or difference.

Synthetic *ecology* contrasts with Castronova's synthetic worlds and Murray's synthetic environment, not through semantic discrepancy, but in its attempt to bridge the engineered (either precisely or accidentally) synthetic world with the enacted significance of the umwelt as found in Jakob von Uexküll's writings.[19] The umwelt, or environment as von Uexküll understands it, involves a reciprocal unity of a "perception" world and an "effect" world (von Uexküll, 42). Von Uexküll's poetic descriptions of a tick's sensory and motor capacities, or his sketches comparing a fly's visual field to a mollusk's, evoke the complexity of a/biotic systems

[18] While this reflexivity with regards to the human role in the system would certainly belong to the second wave of cybernetics as well, Murray's approach is not one that reduces nature to informational circuits. But nature is still seen as a pre-existing backdrop onto which humankind exerts action and causes damage. Murray naming the environment "synthetic" is, for all intents and purposes, a way of exemplifying the scale of a species' influence on the natural world. The environment is dynamic, and human actions are integrated into a new synthesis therein.

[19] Jakob von Uexküll might provide an interesting conversation partner for object-oriented ontologists, who, in their desire to remove the correlationist assumptions of humanist discourse, enshrine the object (i.e. as analogically understood by human perception and technics) as real, extant, or subjectively approachable.

that aren't superseded by the human, or built upon a given backdrop of nature. Instead of a block-like assemblage of organisms fixed in a pre-existing space, we have an ecosystem of interacting machine operators variously occupying different worlds (von Uexküll, 45). Our fields of perception and action are always situated and limited, so the language, images and processes used to connect across these umwelt's must be understood as partial, artificial, and at times even conflicting. A synthetic ecology, then, is also an epistemological articulation meant to highlight the perceptual awareness of bodies and circulations brought together by a digital architecture, in many ways less than, but also greater than a particular habitat or ecosystem. Christopher Hight, for one, sees interdisciplinary design practices as a way to intervene on the ecology of the Anthropocene, projecting "new synthetic hybrids that entangle natural processes with social/cultural process, *through* the mediating domain of the subjective and affect." (2014, 101) It is surprising, that despite Hight's acknowledgement that Guattari's ecologies are inflected by Bateson and cybernetics, he in turn argues that it is landscape, architecture and urban design which becomes central for reflecting upon and mitigating the deleterious effects of the Anthropocene.[20] Like Bratton's "stack," design here is a sort of speculative fiction imagined to integrate aesthetics and affect with pragmatism and ecological necessity into a synthesis of a livable future. It's worth highlighting that the kinds of sensing, monitoring, designing and communicating for such a world is only possible through the control parameters of software systems. The trend – of software forming the apolitical ground for ethical production, equitable

[20] Hight further describes how *umwelten* became central to Felix Guattari's *Three Ecologies*. This environmental network is constituted from social, subjective and natural ecologies, similar to the ways Bateson's cybernetics systems "emerge" from differentials in subsystems and their interactions (97). Yet even Hight's acknowledgment of breaks within the biopolitical regime utilize both aesthetic and computational concepts without interrogating software as the ecology for intervention: "Anamorphosis, the uncanny, the glitch, the modulated, the hyperorganized – all are techniques of deterritorialization aimed at disrupting the quotidian life-worlds to manifest a common ground occupied by different systems. Its geometries intensify the entanglements of systems in strategic ways and turn mere overlaps of *umwelten* into intersection and encounters." (98)

consumption and even borders of thought persists unchallenged. This epistemological (or with McLuhan, prosthetic) dimension lingers in progressive responses to technological surveillance and design practices, where a reflexive critique achieved through mastery of system elements is seen as the only way to intervene. The work of critical engineers – like Julian Oliver – is noteworthy for this type of playful and disruptive production of awareness.

This foray through various streams of ecology and synthesis was not meant to be exhaustive, but to highlight elements that have been associated across time and disciplines for the construction of new understandings and the building of worlds. Notably absent was a focus on the various converging and alternating cybernetic projects of the 20th century; for the sake of brevity, I would defer to N. Katherine Hayles' genealogy of cybernetics (1999). That said, the lack of cybernetics programs identifiable 'in name,' and yet diffused into behavioral psychology, landscape and architectural design, computer science, artificial intelligence and various other research programs is an index of the mixed-reality integration characteristic of a "fourth phase", what Hayles says involves, "environments in which physical and virtual realms merge in fluid and seamless ways (2010, 148-9). While I'm less interested in this congruence of virtual and actual through mobile interfaces, overlapping ecologies of the synthetic do often meet in systems and through interfaces that might be considered cybernetic in design or in function. Switching the focus away from cybernetics and towards synthetic ecology, however, moves us away from analogies and teloi and into the realm of use and performance.

Intro to Chapters

Each chapter that follows, situates a particular digital model or framework that is overloaded with meaning, yet undertheorized from the perspective of daily system use. While chapter 2 deals with "The Platform," chapter 3 "The Application," and chapter 4 "The Grid," all

of them zoom in on very particular examples of these wider systems of digital living. The point is not to offer an exhaustive understanding of these informational environments, but through peculiar encounters with platforms, applications and grids reveal the rhetorical maneuvers and material changes occurring upon and through them. For these reasons, each chapter calls attention to the verbal, visual, and procedural force with which these new systems are implemented. This is done in tandem with situating artifacts of digital moments in relation to their designers, implementers, regulators, and importantly their communities of use.

Chapter 2, entitled "*Circulation and Captivity in the Minecraft platform: Stages, Engines, Fields*" expands upon the notion of synthetic ecology that I introduced here by elaborating one of the more significant changes to capitalist systems of production in the past 20 years: the introduction of the **platform** model. The chapter, however, comes at this model circuitously, through looking at the open-world videogame *Minecraft*. The game *Minecraft* frustrates some of the distinctions that are often made between a pipeline model of production and a platform, and for this reason proves a helpful interface between earlier methods of distributing assets and more contemporary ones. The game can still be purchased as a fungible commodity for a variety of different gaming platforms (e.g. Playstation, Steam, Xbox), and yet so much of what defines *Minecraft*, is to be found in how it circulates. Even in pre-capitalist systems of production, stuff was circulated between producers and consumers; unlike the relations of production required to meet one's needs in Marx' Critique of Political Economy, circulation here often prefigures desire. Platforms are often distinguished by their schematic flattening of the distinction between creators and users, so that any point of access could both a moment of production or consumption or both (versus a more "classic" pipeline model where raw materials are transformed in their flow from mining to crafting to distribution to consumption). In a platform

arrangement, both users and content creators (i.e. only distinguished by the event) in turn, add value to the platform owners – whether that be in the form of new digital assets by creators, or in the network effects provided by multiplying users in a digital ecosystem.

When looking at *Minecraft* in particular, we can see that design decisions made in building the open-world game has provided this capacity to be used for all manner of circulation. There is no singular, or standard use of the game *Minecraft.* The game's openness proves it not just an allegory (or with Wark, an allegorithm) for platform capitalism, but a design platform in itself. Innumerable games have been designed, released and played upon *Minecraft* as a gaming engine; notable is how the *Minecraft* platform has been used to train A.I. spatial navigation with Microsoft's Project Malmo. Because of the game's metric correspondence, the game has been used as a visualization field for fictional word building, pedagogical demonstrations and the 1-to-1 representation of geo-spatial data; this ability to map and plan environments can be seen in U.N. Habitat's project "Block by Block" which uses *Minecraft* as a design tool for community building projects. Finally, *Minecraft* has become a performance stage for all manner of content creators in filming machinima, marketing new products, and generating youtube celebrity value. The chapter ends by following one particular content creator – Kurt J Mac of *Far Lands or Bust!* fame as he attempts a 10 year+ journey to find the edges of *Minecraft's* "infinite" maps. Mac's journey reveals some of the problems at the center of platform production, wherein users are continuously subject to the relationship with platform owners, to the point where triggering affect for profit, or building infrastructure through play, are part of the day-to-day operations in a digital environment.

Titled "*There is No Non-Move: Data Bodies and the Performance of Apps*", Chapter 3 follows a significant mechanism for communication and exchange across digital synthetic

ecologies by looking at **APIs** through the Facebook platform. Application programming interfaces are one of the means for digital designers to connect two digital systems – whether that is to nest their products within new digital platforms, "call" data from one ecosystem into another, or enact operations with environments that might not use the same names or syntax of the native app. APIs allow systems to communicate for both data collection and product improvement by platform owners, so that ultimately users can communicate with and across applications. Apps are the primary way we message others across digital devices; apps are a central point of access for data about the world. Additionally, the apps I look at are part of constructing an understanding of the self. While this chapter centers on the way apps work in the Facebook ecosystem, many of the mediating factors of these apps can be seen in the wider milieu of icons waiting to be touched on our iPhones. Facebook apps bring into focus the simultaneously personal and political risk when living across digital applications: they are not our own. This means that the playful understanding of the self (constructed on personality apps) are as much points of access for corporate and state power as they are representational frames.

This chapter picks up on the theme of being "always too late" when examining digital artifacts amidst the forever newness of digital architectures; much of the scandal generated by Cambridge Analytica, or the flash of recognition at the violation of privacy by a particular app, is often immediately buried behind the latest update or newest news cycle. While there does seem to be compounding negative feelings towards a platform like Facebook, the company has also captivated contemporary imaginations with its recent pivot to 'the metaverse.' But the beauty of hindsight, is that you can tell a story about a kernel evident in a more diachronic analysis. At the core of this chapter is an articulation of the thread that remains through all of the pivots of Facebook/Instagram/Whatsapp/Meta: pecuniary sociality. Now defunct apps like "What are

Your Most Used Words" or "This is Your Digital Life" helped Facebook in its multiplication of both data and social connections through a logic of association that was entirely reducible to frequency. If views, clicks and conversions are what matter upon a social network, then any increase in capacity for transit will create bits of pecuniary value that can be accumulated to the detriment of other values. Once connection has become currency, there is profit to be made in multiplying disinformation, hate speech, propaganda and general confrontation. Facebook is not alone in worshipping a sociality that is pecuniary, as this tendency seems to remain central for the Instagram and TikTok "influencer."

My final chapter: "*Monitoring the Grid with Smartness and Energy Meters*" examines the synthetic ecology of the "grid" – a speculative and physical arrangement linking generation, transmission and distribution in California's energy system. Central to this chapter's approach is a practice of shifting scales from the large-scale civic and private-sector projects for energy generation to more local or minute encounters with the energy grid in the home or on an app. As I zoom in to focus on particular devices, follow specific policy goals, or zoom out to see the spatial transformations necessitated by experimental energy generation projects built upon those policy changes, I trace how the grid comes to operate according to a modular arrangment. In the logic of a grid, every piece is replaceable or upgradeable to meet the shifting needs of consumers, governments and energy investors. Important to this modularity, is how individuals and communities often are subject to risk at all layers of the system – from public-bonded investment risks, to rolling energy rates and the increased frequency of monitoring the home. Communities are sold the promise of a future grid, energy independence, and easy gateways for monitoring, but in the grid's logic, interdependence will often localize disaster.

Broadly, this chapter traces the nexus of technical and policy changes that led to the integration of smart meters into the U.S. energy system, eventually culminating in the development of the Smart Grid. By tracing this ambition to smartness in both M2M (machine-to-machine) technologies and U.S. energy policy, this chapter shows that being "smart" for energy markets both necessitates and comes to be understood through the interface of the meter. This is significant, because over a century of privacy law has been constructed using the threshold of the home as the physical boundary which delimited public and private. The meter provides intimate access to the home, and yet also helps to make our energy use "smart"; as such, it is a cornerstone for conceptualizing the automated, real-time monitoring systems proliferating in the contemporary Internet of Things. Furthermore, this chapter argues that the perpetual monitoring of energy systems fails to be recognized as surveillance precisely because the meter's smartness exceeds the visual. Metrics and monitoring therefore sit uncomfortably within Foucault's disciplinary regime or Deleuze's control society, as their everyday operations both modulate and exceed the rhythms of bodies within the home.

Platforms, applications and grids. These three ecologies of digital circulation are as much rhetorical infrastructures as they are physical ones. They provide a situated perspective on particular digital interactions, but there is one profound similarity that goes beyond the material convergence of digital signals across optical networks. All of these ecologies flatten or collapse relations to make elements within the system communicable or interactive with each another. Platforms flatten the relationship between producer and consumer, so that anyone can generate, use or transfer content across the ecosystem. Applications flatten semantic and operational differences, so that programs can access data and trigger processes across borders. Grids have properties of both platforms and applications, as they attempt to collapse operational difference

and distance, and render production and consumption possible at any node in the network. When any of these ecologies fail or collapse, however, they reveal the flattening to be a convenient obscuring of new hierarchies and lingering old inequities. And the failures are not equivalent. Case in point: when ERCOT failed due to abnormal storms in February 2021, and the Texas energy grid collapsed, certain skyscrapers stayed well-lit while others froze to death in private residences. This extreme example highlights the ecological relationships synthesized through physical computing infrastructures, and the lives that are flattened into user-relationships through these systems.

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Ch. 2: Circulation and Captivity in the *Minecraft* Platform: Stages, Engines and Fields

"If production and the social overlap, then the "field of desire" and the "field of labor," the "economy" and the production of subjectivity, infrastructure and superstructure, can no longer be taken separately." – Maurizio Lazzarato, (2014, 50)

"Everyone says that in the beginning god made everything, but I think it was actually construction workers." – 5-year-old *Minecraft* player

Kurt J. Mac has been walking west since March of 2011. Well, not exactly "walking," and not quite "west" as the sun sets, but over 10 years of his life has been dedicated to making "Far Lands or Bust!" – a Let's Play series he streams on Twitch, archives on YouTube, and shares on his website. During each episode (there are over 813), Mac moves through the game's ecosystem for approximately 30 minutes: ascending pixelated mountains, navigating algorithmically-defined seas, and talking over the first-person perspective of the gameplay. Mac's lofty goal is to reach the borders of a near-infinite, procedurally-generated world; after 10 years, he is only a third of the way there. The game is *Minecraft,* a three-dimensional, sandbox videogame that allows users to play throughout expansive ecological biomes and engage dynamic processes as they imaginatively construct and explore landscapes of PGC (procedurally-generated content) with open-ended play. The title encapsulates *Minecraft's* primary functions: players **mine** a variety of materials (e.g. plants, animals, minerals, wood) using an array of tools (e.g. picks, axes, hoes, and weapons), and then **craft** things (e.g. cook food, build houses, tools, monster traps, etc.) with the troves they have acquired.[21]

[21] This is, of course, a simplification of the game, yet its openness cannot be overstated. Game modes alter the focus of the game, but by and large the collecting and building (along with circadian cycles and weather) remain unchanged. In creative mode, players have access to all materials and block types without having to collect them, but they still must clear landscapes they wish to design upon. Survival mode requires players to collect supplies during the day and build shelters, as monsters appear during the night to attack. Game progress is slower, as more precious materials (e.g. diamond, redstone, blaze rods, etc.) require increasingly advanced materials to acquire.

Mac's journey is helpful for framing the recursive relationship that forms between software systems and their users. As Mac ambles through a version of the game (i.e. 1.7.3), his movement procedurally-generates a "there" that doesn't pre-exist his play. Mac's play generates income each month, which allows him to both continue the epic journey, and capitalize upon it as a walkathon for charity. On his 600th episode, Mac offered encouragement to those frustrated by the gradual pace of his repetitions:

> "Fear not. True, we may not be blasting through these goals in a week, like certain marathon charity fundraisers go…but that is not the way of our journey. Our journey is slow and constant…we will get there when we get there. Progress is being made." (Mac 2016)

The procedural ability of *Minecraft* to repeat and introduce change in feedback loops of creativity, i.e. its iterative openness, is central to its capacity to game-together fields that would have been analyzed discreetly in earlier stages of capitalism. Kurt J. Mac walks us into the sticky imbrications of play, charity, labor, economics, ecology, software, and imagination that is made possible by software ecosystems such as *Minecraft*. The *Minecraft* "sandbox" represents a new political economy wherein digital play is both the bulwark against the tides of corporate (also state, "official") interests, and the engine that enables their rise.

In October 2011, a few months after Mac's journey commenced, Mojang AB – the Swedish videogame company behind *Minecraft* – began a project titled "Mina Kvarter" (Swedish for "My Blocks"). This pilot project with Svensk Byggtjänst (Swedish Building Services) used *Minecraft* as a visualization tool to provide community input for the redesign of the Million Programme housing projects.[22] The following year, a partnership was established

[22] The Million Programme was a huge social program instituted by the leftist Swedish Government in 1965; they subsidized and built over 1 million homes in approximately one decade. https://mojang.com/page/56/

between Mojang and the United Nations Human Settlements Program (UN-Habitat) under the name *Block by Block*. This new charity expanded upon the pilot, deploying *Minecraft* to visualize, articulate and collaboratively-construct public spaces that have fallen into disrepair across poor, urban centers. Using the game as a CAD (Computer-aided design) tool, residents in Kibera, Nairobi designed and displayed their *Minecraft* models for a new Undugu Playground to stakeholders (FyreUK 2012). *Block by Block* is now a development methodology and is used at numerous sites in over 35 countries. The work is financially supported by regional municipalities, independent charitable contributions, Mojang licensing agreements, and technical and financial oversight from the corporate giant Microsoft.

In 2015, Project Malmo was started at Microsoft under the name AIX. Using *Minecraft* as a training platform, Malmo allows users to experiment with the education of artificial intelligence agents through deep reinforcement learning (Johnson et al., 2016). Dr. Katja Hoffman, a developer working on the project argues that *Minecraft's* "virtual environment really lowers the barriers of entry to A.I. research, and overall it reduces the cost of running experiments" (Microsoft Research 2016). Because *Minecraft* consists of complex, heterogeneous, three-dimensional worlds, it can be used as ground upon which to teach agents spatial navigation and information integration, while reflexively training users to use agents as assistants/help bots (Montfort et al., 2017) (Allison et al., 2017) (Geiger et al., 2016). The simplicity and accessibility of the game engine is driving a new generation of artificial general intelligence research to be deployed into robotics and collaborative virtual assistants. It is betwixt these three distinct, yet entangled, machinations that *Minecraft* becomes visible as a platform. Physical environments, human and nonhuman agents, and open (and closed) systems can

interface through the use of the platform, circulating various energies, information, desires and bodies in the process.

This chapter ventures through these various iterations of *Minecraft*, following both the values reinforced via the game, and the affective, energetic, and conceptual movements in and out of the system. While exploratory in scope, I do not endeavor to exhaustively catalogue the game's numerous uses or communities, but to untangle how contemporary software platforms game-together work, imagination, education and memory with control. As such, this chapter is only tangentially concerned with past debates about free or immaterial labor (Terranova, 2000) (Hardt & Negri, 2000), or the conceptual threads found in game studies in the forms of 'playbour' (Kucklich, 2005) and 'cognitive capitalism' (Dyer-Witherford & de Peuter, 2009); instead I attend to the affects conjured, the discourses propagated and the infrastructures lain by these different worlds. Zooming in on *Minecraft's* various capacities is a conscious attempt to begin with an ecological frame. Labor and subjectivity are never far from view, though the focus is instead upon how they are pulled apart and reconfigured across environments. In my understanding, the material relations of a platform system differentiate play into the three modes or productions: game, visualization and performance. As I trace the numerous iterations of *Minecraft*, I offer an explanatory diagram for platforms that maps three conceptual architectures – the engine, the field, and the stage – with their respective repetitions: games, visualizations, and performances. The conceptual triad I offer is an abstraction that delineates not taxonomies, but circulations of the platform. The diagram both illustrates the platform as *a software ground that aligns user desire* (e.g. creative, open, egalitarian, multidirectional) *with corporate interests*

(e.g. efficient, data-generating, controllable, scalable), and pokes holes in said model with the flows that don't fit.[23]

The stakes of this chapter are threefold. First, in designating a videogame like *Minecraft* as a platform, I am questioning the givenness of those computational systems that have come to be seen as necessary for, and generative of, everyday life. In other words, because players consciously subject themselves to *Minecraft*'s artificial rules, and in so doing enact varying vectors of self-determination within that milieu, the play of the game seems relatively innocuous. This sharply contrasts with the brutal utility of a new political economy whose serial engagement both constructs and displaces agency as it generates data and value. But platforms seem exciting in the *Minecraft* example; it's this affect-laden relationship that is essential to the circulations and incarnations of power endemic to platform relationships. Access is always a two-way street. Second, while my thinking is indebted to platform studies, the decision not to foreground a critical analysis of the programming platform "Java" (in which *Minecraft* was designed), locates this project outside of its methodological purview. Instead, I emphasize a more ubiquitous deployment of platform as corporate model, redirecting focus from how unique software systems, "enable, constrain, shape, and support the creative work that is done on them," (Montfort and Bogost, 2009, vii), to how they become nested within layers of algorithmic

[23] In the foreword to *A Thousand Plateaus*, Brian Massumi writes that Deleuze and Guattari were not interested in subjects or identities, but thinking *in the act*: "A concept is a brick. It can be used to build the courthouse of reason. Or it can be thrown through the window." (xii) The conceptual brick is near and dear to me, both in its aesthetic relation to *Minecraft*, and the enunciatory force of a thinking that is no longer object-oriented. The bricks of Deleuze and Guattari from *Anti-Oedipus* that animates Massumi, are mobile segments of material and meaning, broken apart and re-composed: "*We must conceive of each brick as having been launched from a distance and as being composed of heterogeneous elements: containing within it not only an inscription with signs from different alphabets, but also various figures, plus one or several straws, and perhaps a corpse*." (1983, 40) My conceptual abstraction is offered as a general antagonism towards a more Heideggarian approach, and his present-at-hand or ready-to-hand differentiation. Instead of reinforcing divides between tools and tool wielders through varying attitudes of utility and failure, my diagram helps to not only chart where platforms demarcate difference, but the changing nature of space, signification, and "thinking" enacted at the various circulations of a system.

'everydayness' through increasingly monopolistic acquisitions and affiliations. Third, and most importantly, this chapter complicates a dialogical understanding of platform – i.e. a two-sided market where 2 points exchange goods and services (Eisenmann et al., 2006) – by evoking the concept of synthetic ecology first shown in the introduction, and further articulated in the field of landscape and architectural design (Waldheim, 2014). **Synthetic ecologies** name *the lived artificial environments that link together action with perception, and production with consumption, to both generate and siphon value, all while enacting material configurations internal and external to their discreet operations*. Put differently, platformed synthetic ecologies are reflexive software environments that break apart, assemble, and cultivate informational, energetic and material flows. They are reflexive both in how they cultivate patterns that come to be seen as involuntary or natural, and in their circulation as ways of knowing. Synthetic ecologies, similar to Gilles Deleuze and Felix Guattari's "machines" in *Anti-Oedipus* (1983, 38-41), produce new circulations (of desire, data, energy, knowledge) that don't always resolve in profit at nodes or resilience at their edges. As I've written elsewhere, these junctures, divergences and jams can open up a space for improvisation, spark reflection upon the contingency in the system, and at rare moments, even produce system failure (Johnson, 2019).

Naming the ecosystem of intersections that dynamically and recursively form player and game "s*ynthetic ecology*," blurs affect with economy, psycho-socialization with infrastructural development, and publics with servers and digital space. As the user finds her/self in various synthetic ecologies, she rehearses system know-how, circulates energy and desire across the ecosystem, and generates value in the form of what the autonomia would term general intellect, but also in the form of data to be siphoned off by system owners. Because information systems facilitate these transfers, eco*logy* helps carry the recursive inflection to knowledge and knowing

endemic to ecosystems. We know based upon the system we operate within, and "knowledge" looks markedly different as we move from one end of the triad to another.

As a conceptual apparatus, synthetic ecologies helps to attend to the generative combinations of avatarial bodies with virtual geographies, objects, in-game operational mechanics (i.e. physics), non-player characters controlled by the game's A.I., not to mention other networked gamers that together construct the often closed worlds on which the desires of "open" operates. But further, synthetic ecologies imbricate the mesh of information networks, energy grids and energetic circulations, resource extractions and electronic assembly centers, alongside the geographically-diffuse lands upon and through which these gaming infrastructures are built and propagated. The material relationships are quite easily forgotten once masked by the rhetoric of the open world of the game or the icon of the software application. The synthesis of all these elements gleams with the hopes of a unique, liquid possibility to not just open-world gaming, but algorithmic life writ large, a desire that finds its way into the labors and dreams of its workers and users. For example, on the morning of the Microsoft acquisition of *Minecraft*, Kurt J. Mac responded to worries from both the game community and his audience/patrons with a defense of Mojang and Notch: "You see a little bit of the glimmers of hope for the rest of us...in an otherwise era [sic] where there isn't that much. This is kind of a real life success story here that we should celebrate...we'll run with the punches and react to them when they happen" (Mac, 2014). A change to the ownership of a platform, and the rippling effects to the many worlds that have been built upon it, bring affective responses, requiring at least one content creator to hope against hope that things will be better. *Minecraft* provide a space to model, practice, share and explore, as it foregrounds this relationship of system effects to operator affects in environmental biomes.

This braid of user play, software systems and ecological knowledge can be seen in contemporary game studies scholarship. Alenda Chang and Colin Milburn chart the ways in which games can move beyond programs for domination and control to be seen as environmental texts, model ecological principles, and cultivate a dynamic environmental imagination. Chang says that, "Games can offer a compelling way to reconcile a deep connection to nature and the nonhuman world with an equally important connection to technology and the virtual." (2011, 58) Similarly, Milburn questions if, "gaming can create the conditions of ecological awareness necessary to address environmental risk, as well as the risk that gaming itself represents." (2014, 204) Milburn's article traces how games and game systems are a major cause of environmental degradation, from the perennial violence that accompanies coltan mining in the Congo to the global stockpiles of e-waste (201-3). He goes on to offer examples of how videogames might promote response-ability in users, whether through narrating environmental catastrophe or through allegorizing the relationship of users to complex systems (212). These scholars are concerned with how games might cultivate a green disposition or spark an embodied awareness of our complicity in environmental destruction. I share Chang's argument that videogames provide users the 'environmental procedural rhetoric' to "enable often abstract data and otherwise distant threats of ecological calamity to take very real and even operable form, combating the twin hazards of apathy on the one hand…and paralysis on the other." (2009, 2) With Milburn, I share the belief that game play is pregnant with the possibility of affective attunements, exposing both the disjunctures between in-game narratives and procedural actions, and those between platforms use and environmental consequence.

In what follows I do not trace the environmental impacts of *Minecraft*, but instead utilize synthetic ecology to see the ways in which a platform like *Minecraft* bridges bodies and spaces

in both computational and meat space. Amanda Phillips argues that *Minecraft* is an algorithmic ecology, or an ever-expanding digital world that prioritizes spatial complexity and combinatory possibility over and against a photorealistic aesthetic or narrative core (2014). *Minecraft* "[subsumes] the ecological within the mathematical" as landscapes and system dynamics are produced through procedural generation, not pre-scripted assets (109). Phillips' focus on queering the *Minecraft* platform helps reorient players around the multiplicity of embodiments in the dynamically-created world, and frustrates any simple goals of progressivist development and capitalist expansion. While I agree with Phillips' thesis, I see the novelty in the strange encounters that an algorithmic ecology like *Minecraft* displays when it combines outside of the game world. This possibility, or "platformativity" if you will, affords multiple futures. As we proceed, I question what qualifies as a platform, and follow how the openings of a game platform change when it is synthesized into a corporate model. My focus, by extension, is twofold. How does an ecological frame allow us first, to attend to the affective bleed across meat and silicon, and second, to locate the significant infrastructures mobilized in different afterlives, or circulations, of a game?

Each section that follows is oriented around one iteration of *Minecraft* – from the earliest java-based web post to the artificial intelligence engine, the visualization tool and the performance stage. If the platform has indeed become the new valuation model for digital capitalism, what are the ecological and epistemological implications for the bodies and systems transformed by streams of information? How do we make sense of dynamic play and virtual biomes, which together conjure a sense of technological animism in world that is ecologically damaged, in large part due to those same computational technologies?

Capturing Imagination: *Minecraft* from muku to Microsoft

In the early morning hours of May 17, 2009, the first test version of *Minecraft* was uploaded to Tigforums, a place for independent game designers to share, comment, and receive feedback on works in progress. [**Figure 2**][24] The humble first appearance of this solo project by Markus "Notch" Persson, inspired by the games *Dwarf Fortress*, *Dungeon Master* and *Infiniminer,*[25] immediately sparked excitement in this online community of indie programmers. In less than an hour, the first screenshot of a user's build – a short, stone bridge – was posted from the handle 'muku'.[26] Ninety minutes after 'muku's' bridge, contributor 'jwaap' posted a video to the forum with the comment, "stop killing my free time :)". It is fitting that his video – evidencing the first voxel (volumetric pixel) art created in *Minecraft,* showed the pixelated plumber Mario.[27] In addition to posting their virtual constructions, users reported bugs they encountered, and discussed many of the final game components in those first 24 hours of Notch's post: the name of the game – *Minecraft: Order of the Stone* (later simplified to *Minecraft*), the desire for persistent networked worlds, and ideas for future game types (e.g. Survival Mode).[28] A latter post from 'muku' likened *Minecraft* to a computational set of *Lego*[29] blocks, a now-ubiquitous analogy to the combinatorial possibility of the toy: "The fun in this game clearly is in

[24] https://forums.tigsource.com/index.php?topic=6273.0 Accessed March 9, 2017.
[25] In the official *Minecraft* wiki, the release of *Infiniminer* is included as the first entry in the official timeline of events before the appearance of *Minecraft*. http://minecraft.gamepedia.com/Timeline_of_events While *Minecraft* is not a clone of *Infiniminer* (e.g. Notch's previous project "RubyDung" already contained textures for both cobblestone and grass), it isn't possible to talk about its origins without citing it this forebearer. While Notch references a "more accessible" *Dwarf Fortress* (2002, Tarn and Zach Adams), and the first-person view of Dungeon Keeper (1997, Peter Molyneux) as qualities to the game he wanted to build, *Infiniminer* (2009, Zach Barth) is explicitly named for its aesthetic and procedural inspiration. https://notch.tumblr.com/post/227922045/the-origins-of-minecraft Accessed March 10, 2017.
[26] https://forums.tigsource.com/index.php?topic=6273.msg200800#msg200800 Accessed March 9, 2017.
[27] https://forums.tigsource.com/index.php?PHPSESSID=ms8r9k0ticqet1h7vokgmeaom6&topic=6273.msg200825#msg200825 Accessed on March 9, 2017.
[28] https://forums.tigsource.com/index.php?topic=6273.0 Accessed March 10, 2017.
[29] Lego responded quite late with the comparable digital architecture *Lego Worlds* on March 7, 2017. *Minecraft,* on the other hand, has had a presence in Lego-brand merchandise since the summer of 2012 with their release of Minecraft block sets.

building; it's a bit like a huge virtual box of Lego. I don't think that forcing players to do other things would help the game at all."[30] Reviewing the humble beginning of *Minecraft* on Tigforums, Graham Smith from *PC Gamer* notes how, "it's remarkable how quickly the game seemed to **capture player's imaginations**"(2012).

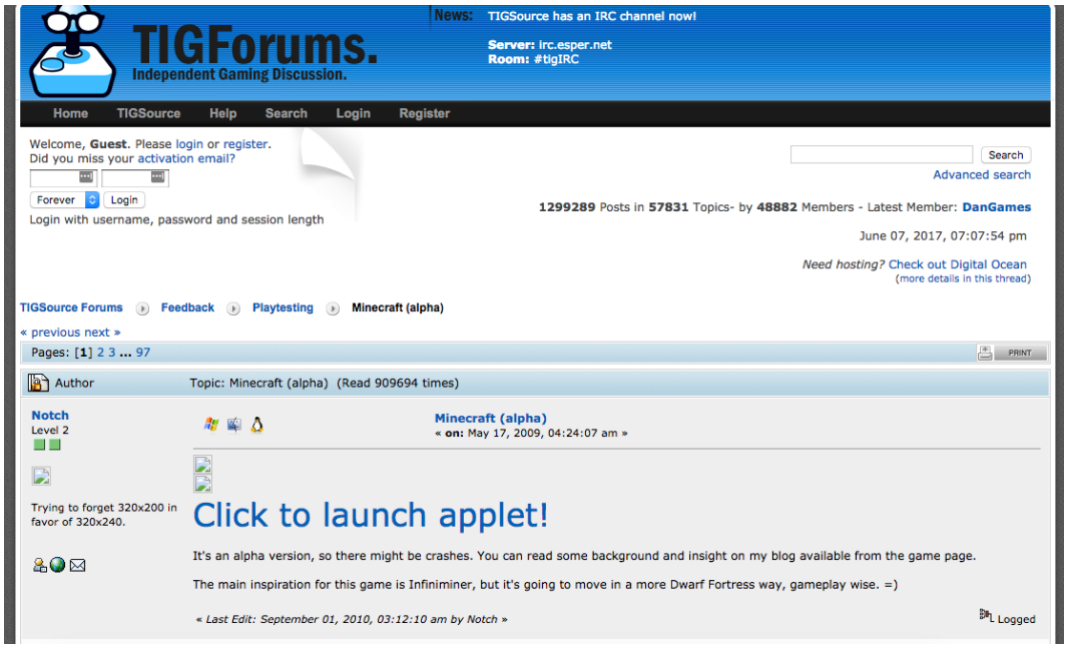

Figure 2: TIGForums receives the first java build of *Minecraft*: May 17, 2009

Capturing imaginations is a rather apropos description for *Minecraft* as well as the affective encouneters at the surface of contemporary software platforms as they connect and mobilize utility with desire. Like the use of Legos, the pure, undirected play afforded by *Minecraft* is imagined to capture the imagination, mobilizing users into creative production. Josef Nguyen, for one, argues that *Minecraft* belongs in a much longer lineage of building toys that situate American desires for creative individuality alongside anxieties for social conformity (2016). This discourse of creativity, Nguyen notes, imagines it to be the "the driving force for

[30] https://forums.tigsource.com/index.php?topic=6273.0 Accessed March 10, 2017.

contemporary economic growth" (474). *Minecraft* first requires the player to be "an individual subject, rather than one absorbed by social ties and dependencies" (499). By placing the game's objectives alongside island narratives like Robinson Crusoe, he shows how the primary drive to survive and build reduces both narrative and algorithmic environments to a version of Heidegger's standing reserve (489). From LEGOS to *Minecraft*, even the imagination, is wrangled into service for the creative economy.

Returning to the analogy of playing with *Lego* blocks, we see that some of the correlation breaks down when applied to *Minecraft*. Three substantial differences are worth noting. First, through a convergence of perspectival views, haptic interaction, and tethers of affectivity, *Minecraft* users can inhabit the game's architecture.[31] Memories of avatarial movement and the manipulation of environments, combined with save-states and world portability (between hardware platforms), permit a serial return to places that persist relatively unchanged by the ravages of time. A second, related divergence from *Legos*, is how the platform facilitates interactions that aren't strictly "play", through software architectures. Beyond a virtual presence sustained through spatial experiences and the archiving of memories, users can set into motion and experience dynamic system processes, craft almost anything from fictional, physical, or data sources, and collaborate to build and buttress alternate spaces of interaction across great distances. Third, and proceeding from the first two, while playing with *Legos* is certainly a

[31] Here I'm specifically interested in the metering of affectivity across the interface, not the more specific use of tethering written about by Christopher Goetz. In his article "Tether and Accretions: Fantasy as Form in Videogames", Goetz argues that games like *Minecraft* and *Terraria* (a *Minecraft*-inspired 2D sandbox game) are prime forms of the everyday fantasies of the acquisition of power (and I would add, capital)(2012). In a tether fantasy, bodies oscillate and enjoy the border between the danger of exposure in a wilderness and the relative safety of a home or base; alternately, in accretion fantasies, one tends toward the accumulation of experience and agency in game spaces, as one explores the world and accrues value within a relatively weak body (2012). Goetz is specifically addressing the ludology/narratology debate that occurred in game studies in the early 2000s, and his use of "fantasy" here is understood as, "the means by which the game transcends its dividedness as an object of representation and simulation" (Goetz, 420).

physically-embodied and creative activity, the mere loading of the game *Minecraft* enacts material transformations far beyond any representational function. *Minecraft,* like most 21st century software platforms, only emerges from machinic interactions: electrons flowing over electrical cable and flash memory, light pulsing over fiber optic networks, radio waves bouncing through the air, application programming interfaces translating orders across operating systems, and massive infrastructures for consuming, transmitting, and maintaining networks of goods, energy, and information.

Following a year "Indev" (in-development), the alpha version of *Minecraft* was released by Notch and friend Jakob Porsér under the newly-formed Mojang AB, their independent Swedish game developing and publishing company.[32] Persson and Porsér invited Carl Manneh, a previous colleague of Persson's, to serve as CEO so that the two founders could each focus on game development (MCV 2012). *Minecraft* did have an official release date, but that was November 18, 2011, over 2 years after people started playing with, and paying for it. It has been over 12 years since that first post on Tigforums, and the game has now sold over 200 million copies, making it the best selling game of all time, eventually surpassing the combined sales of *Tetris* (Taylor 2018).[33] Due to an uptick in players following global stay-at-home orders, an average 126 **million** active users play *Minecraft* **monthly** across the globe, interacting with the software through a variety of media streams such as PC, Apple TV, tablets, phones, and almost all contemporary videogame consoles (Warren 2020). The enduring plethora of play attests to its

[32] Like so much software, many of *Minecraft's* 'alphas' were so quickly updated, that they were almost impossible to archive. Alpha 1.1.1, for instance, was only available for 3 hours and 25 minutes before it was patched (Zwiezen 2021). Constant iteration, means the official version of the game is always changing.

[33] The number of total downloads topped 250 million at the time of writing, following the addition of a free-to-play version in China which brought in an additional 150 million players.

value by different communities, though the term "game," remains a less-than-helpful umbrella for the divergences *Minecraft* has taken.

On September 15, 2014, Microsoft Corporation acquired Mojang for 2.5 billion dollars. With that, the software giant acquired the rights to *Minecraft.* YouTube searches for all of 2014 place "minecraft" as the second most searched for term that year, following only "music" in popularity(Ramdurai 2014). Following the sale, the founders of Mojang: Notch, Jacob Porsér, and Carl Manneh left the company. Player reactions were mixed, as the indie darling of a game was now firmly in the hands of one of the biggest tech companies on the planet.[34] The morning of the Mojang acquisition, Microsoft CEO Satya Nadella tweeted the following: "Thrilled to welcome the Minecraft community to the MSFT family & excited about the *open-world possibilities* ahead!" (emphasis mine). While "openness" and "Microsoft" might seem 2 terms at odds with each other due to a corporate history of perceived threat by (and action taken against) free and open-source software (Coleman 2013, 80), Nadella's tweet gestured not at a change in Microsoft's licensure practices, but towards the dynamic genre of games to which *Minecraft* belongs.[35]

Minecraft is exemplary of a quality, or capacity, in videogame production towards the development and non-linear exploration of huge 3-dimensional worlds named "open-worlds" or

[34] The storms of affect that regularly ripple across Twitter, YouTube, Facebook and platforms were lively that morning, as *Minecraft* formed an integral part of user's subjectivity. Microsoft was buying not just a product, but the worlds, and ever-expanding imaginaries of active communities. One such player, under the handle "Blues Light" responded at the top of Kurt J. Mac's YouTube channel thread on the day of Microsoft's announcement: "[Notch] clearly thought it was a good idea to hand **not just the game, but us** over to Microsoft. You know what? Perhaps he's right...but if they betray that trust of his and prove him wrong, then we need to get mad. Thanks to Notch and everyone at Mojang we have built this community from the ground up, and we aren't about to lose it! We need to prove to Microsoft that we aren't to be messed with. They paid a pretty penny for the game **and for us**.*"* ("Blues Light" 2014, My emphasis)

[35] While this is outside the purview of this paper, Microsoft Corp. has rapidly shifted to the platform model, following Nadella's helming of the company in February 2014. Mojang was Nadella's first major acquisition. One only has to look to the purchase of LinkedIn in 2016 and GitHub in 2018 to see this dramatic evolution to the platform by Microsoft.

"sandboxes." The majority of contemporary videogames are pieces of digital software that run upon computational hardware to create representations of places, characters, narratives, and events for players to experience through audiovisual interfaces and in turn manipulate via an input device such as a keyboard, mouse or controller.[36] Open world videogames such as *Minecraft* cultivate a sense of possibility through open-ended gameplay, sandbox building components, expansive (often procedurally-generated) worlds, and algorithmic representations of dynamic biomes. [**Figure 3**]

Figure 3: Forest biome. There are over 70 different biomes in *Minecraft*.

Open worlds are ludic architectures that, while occasionally tied together with story and mythology, allow an avatarial[37] body the freedom to explore the world without the linearity

[36] This is, of course, a gross oversimplification. Differences multiply across the history of videogames, from Thomas Goldsmith's analog "cathode-ray tube amusement device" developed while at DuMont in 1947 (Blitz, 2016), to early arcade gaming machines like Pacman with hardware, software, and interface that were essentially indistinguishable to players.

[37] Avatar, from the transliterated sanskrit avatara, means descent or coming down. In the Bhagavad-Gita 4:7, Krishna explains the concept of the avatar to Arjuna: "Whenever and wherever there is a decline in righteousness...at that time I descend myself." While the verse here does uses "tadatmanam srjamya" - translated

characteristic of most narrative media. These open-world elements are increasingly commonplace in the videogame medium, with many triple-A titles utilizing a multi-directional approach to level design, character creation, and style of play. *Minecraft* is unique, because its openness to iteration is not incidental to combat or a mission, but the act of collecting and constructing. By foregrounding building, in a space that is both easily accessible for beginners, and scalable in complexity for those with more advanced skills, *Minecraft* permits a community that extends beyond young players to encompass modders, designers, educators, community developers, computer scientists, and performers. Because the game is built around simple elements of collecting and constructing, is available on almost every computational device and is found in many schools and public libraries, it has proven itself less a consumer product and more an imagination machine – a ground for playfully weaving-together desires, relationships and energies.

Those unfamiliar with the signature blocky, pixelated aesthetic of *Minecraft* might not realize that it has as much to do with its inscription medium as it does with its procedural performativity.[38] The apparent graphical simplicity – wherein all aspects of the landscape, every NPC (*non-player character*), and each avatar is marked according to percentage of meters cubed – obscures a level of complexity far more intricate than its cubic graphics would suggest. The

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"manifest self" and not the typical word "avatara", it is traditionally seen to be an early piece of avatar doctrine (Doniger, Wendy. "Mahabharata." *Encyclopedia Britannica*). The avatar is a fleshy stand-in for persons existing at alternate spacialities, a body that disseminates the will of the gods. I use the term knowing full well its religious and representational connotations. The avatar, in a sense spans representation and indexical trace. As a piece in the game world, the avatar represents a narrative progression in the story, a certain level of experience or potential for efficacy in the space, and a liminal identity for the gamer. As a piece in the algorithmic ecosystem, however, their movements are highly synchronized to the gamer's rhythms, their qualities can be quantified and saved on a magnetic or optical disc drive, and their actions don't merely represent some ephemerality – they are traced to physical changes within synthetic ecologies.

[38] I still remember my impressions the first time I found myself in the minimalist visual landscape of *Minecraft*. I hadn't yet learned to utilize the functional aspects of the aesthetic, focusing on the local unit for mining or crafting, or allowing my eyes to relax in order to take in the expansive unit of a biome whose articulation is felt less in visible markers than in its protocological complexity. Realism this is not; vaguely reminiscent of Seurat's neo-impressionist pointillism, but only if we imagine his brushes as fractions of a meter cubed.

game's physics system demarcates the flow of water and lava, the animation and contagion of fire, the behavior of animals and weather systems, and the capability (and capacities) of avatars across a terrain that is both procedurally generated and practically infinite in size. The 64-bit styled, metric graphics are further overlain with something of a "cubist" operational interface. When the user moves her "head", or changes the perspective of the camera, things are individuated from the landscape. A grass-covered patch of dirt, topped with a yellow flower, is literally circumscribed (drawn around) by the black lines of the graphical user interface (GUI) filling in the form with an acquirable unit. [**Figure 4**] This is an aesthetic of the spreadsheet, where everything in *Minecraft* is reducible to the units of resource management, a stack of surplus, or a free space to fill up within a bag or a chest. With the exception of very few items such as tools, most acquirable materiala (e.g. grass, sand, dirt, rock, precious metals, etc.) can be organized into stacks of 64; changes in amount never alter the performance of an avatarial body.

Figure 4: The GUI draws around the unit of focus. Grass is "cubed" for extraction.

Each voxel across the landscape contains within it an indeterminate kernel of futurity, insofar as with incredibly few exceptions it can easily be replaced by anything else at the next instant of user production. Beyond this functional capacity a libidinous desire is drawn off – where the world is open to any and everything one can imagine within it: "To me there's so much more that could be done to the game. It's not really finished yet, and I don't think it's ever going to be" (Notch in the film *Minecraft: The Story of Mojang*). *Minecraft* is multiple, hence separating out something like "vanilla" *Minecraft*, from its versions, updates, and modifications proves incredibly difficult.[39] Due to this, I resist an initial delineation between an "original" *Minecraft* commodity and its various communities of use. Instead of frustrating the material transformations that occur across various media and within units of operation, I attend to the movement and changes across the platform.[40]

Videogame programs such as *Minecraft* are strangely-deforming media that have a dynamic life cycle hard to duplicate in other media. Alexander Galloway makes this explicit in *Gaming*, when articulating videogame action as unique from the acting in a film or the taking of a photograph. "These actions," he argues, "transpire before or during the fabrication of the work, a work that ultimately assumes the form of a physical object (the print). With video games, the work itself is material action. One *plays* a game. And the software *runs*" (2006, 2 – his emphasis). Consider the afterlife of a work in different media: theatre has the adaptation, live music the arrangement, film the cut, recorded music the remix, and software the patch.

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[39] "Vanilla" is a way of delineating the original, unmodded, or unaltered version of a game. But what is original *Minecraft*? Is it classic or alpha? Beta 1.7.3 or the official release? Java edition or bedrock? While we will see that delineating "vanilla" becomes important for Kurt J. Mac's voyage below, it doesn't serve as a helpful, or sui generis, distinction for this paper.

[40] Ian Bogost, in his own version of object-oriented ontology, prefers "unit operations" to the use of object, thing or substance by other speculative realists (2012). It is the flatness of the ontology, says Bogost, which irrespective of scale disallows it from being irreducible to anything else whilst being imbricated in other processes: "We can distinguish the ontological status of computer program-as-code from game-as-play-session without making appeal to an ideal notion of game as form, type or transcendental." (19)

Videogames can enact all of these operations when played, multiplied with the added layers of network interaction, hardware differentiation, and software modifications (mods). This differentiation is compounded by release dates that are often in advance of the game having actually been finished. The limits of *Minecraft's* performativity are in a very real sense the borders of its users' imaginations. This strange status of having no original is not unique to *Minecraft*, and games before or after a major update or re-release can have a dramatically altered diegesis, visual aesthetic, physics-system, and even level of accessibility. The politics of the patch, a minor modulation of form shared with other computational media along what Terry Harpold calls "the upgrade path," are situated in its compulsory status: without the patch or upgrade, your software may be unplayable, violate its terms of licensure, or even be left open to intrusion as a potential vector for infection (2008, 3).[41] Finally, mods can perform dramatic phasings of the game that often overwrite any "original" in favor of utilizing it as a digital environment for entirely new content, purposes, or milieus. As Notch said above, *Minecraft* is perpetually unfinished, and this consistent mutability allows changing desires and functions to attach to/with it.

Minecraft, understood as a platform, foregrounds the recursive relationship of user action within the software environment, a relationship I will argue is best understood as a synthetic ecology. Due to the inherently-progressive nature of software updates, and the multiplicity of mods and network connections, platforms can continue to siphon off information at any point in a product's life cycle, regardless of even the definition of the operators circulating therein. The

[41] Terry Harpold: "Because technical innovation in popular computing is driven more by the allure of expanding markets than by something so quaint as a sense of responsibility to historical continuity, commercial discourses of the upgrade path will inevitably promise consumers new and more satisfying interactions, and encourage them to see the older ones as outmoded or no longer relevant." (3) In regards to viral crossover – the infectious body is one of the great motivating metaphors for the upgrade path. Without the patch, we are told, our risk of corruption or digital pathology is increased (2008).

platform stands as such a resilient system of valuation in capitalism because of this flexible utility combined with a perpetually unfinished and updatable model. By placing editions, versions, mods, and originals on a continuum of *Minecraft*-machinations, though, more useful distinctions emerge.[42] The platform facilitates flows of imagination, wrangling collective users' energies towards acquisition and dissemination – of information, bodies and desires. By highlighting these differentials of circulation (e.g. intensity, directionality, temporality), I will show how software platforms are harnessed for functionally different ends with vastly divergent consequences. These molecular permutations are a strength of the platform model, in that each route is a two-way conduit for extraction and production.

Platforms and Machinic Captivation

What precisely are platforms? The word is remarkably inclusive, as platforms can be found in politics, videogames, computational systems, and business models. If we start with a discursive analysis or etymological history of the term, as is the case with Tarleton Gillespie's "The Politics of 'Platforms'," we end with a metaphor that branches into architectural, figurative, political, and computational territories, each of which contains ideological elements that Gillespie argues reveal the platform-holder's status at intermediary (2010).[43] Alternately, if we begin with the videogame lexicon, "platformer" is one of the early game genres, and is

[42] There are innumerable other ways to group the uses of the game: by arbitrarily delineating an original or "vanilla minecraft" (i.e. Mojang-authored, official releases) vs. modded, community creations; through game modes (i.e. creative, survival, hardcore); around distribution-platform lines (e.g. pocket-edition, computer, console, java, etc.); according to visual perspective (1st person, 3rd person, VR-enabled, spectator); across networks (e.g. persistent, console-based, LAN, offline, etc.); or even along intellectual property-lines (e.g. *Minecraft*, *Minecraft: Education Edition*, *Minecraft: Story Mode*, *Minecraft: Realms*, *Minecraft Dungeons,* etc.). They are "interfacings" insofar as they are dynamic couplings of heterogeneous bodies in feedback loops of perception and affection.

[43] Gillespie is helpful for articulating the political valences that attach to the overall discourse on the one hand, and the individual territories on the other. Architectural grounds surfaces, figurative groundings, political stances and computational infrastructures all have varying ways they propagate or advance platform discourse. However, contrary to Gillespie, I would argue that digital platforms do not end up looking like traditional media (359). Instead, they offer a diagram of the permutations of capital following the 2008 financial crisis, that also begin to give us a figure of power's differentiation. Not categorically distinct, but performatively so.

characterized by moving (especially jumping) a character about 2-dimensional landscapes of platforms and obstacles, often indexing player virtuosity and system proficiency in the process (e.g. *Donkey Kong, Super Mario Bros*., *Mega Man*). Here we can see the platform as game mechanic and style. Platform *studies*, an area of media studies articulated by Ian Bogost and Nick Montfort, is concerned with the "abstraction level beneath code" and investigates the system architectures and infrastructural layers that permit and prohibit expressive interactions. (2009, 147). They argue that a platform is "a cultural artifact that is shaped by values and forces and which expresses views about the world." (148).[44] Yet where we start makes all the difference for how we know, what we know, and the community that works from the middle of the system. This paper is sympathetic to Bogost's and Montfort's specific, nuanced articulation of platforms as infrastructural abstractions of soft/hardware, and platform studies has been important for attending to the connections between technical detail and cultural creativity. The platform, however, is also extended pragmatically through the discourse of business management and finance, precisely because it flattens difference and scales quickly in post-2008 crisis capitalism. By coating over the 'soft&hardware' nuances of the Java programming language (which a platform study of *Minecraft* would require), I wish to rack focus onto the diffusion of these

[44] In their paper delivered at the Digital Arts and Culture Conference in 2009 at Irvine, Bogost and Montfort elaborate on some of the frequent misconceptions that a technologically rigorous study of platforms can facilitate. While they would likely not share my more vernacular view of platforms as business model, by starting with a definition from Marc Andreessen – one of the creators of Mosaic and Netscape – they signal the centrality of computation to what platforms are. (2009) I do not "do" platform studies in this paper. *Minecraft* was originally programmed in Java, and I think a critical Java platform study would certainly enliven the arguments I am making. But, *Minecraft* has also been migrated to new software architecture – "The Bedrock Edition" – which resembles C++ but builds upon existing Java code and protocol (Citation?). The virtual machine structure of Java was certainly related to its rapid dissemination across multiple hardware platforms, but it's hard to retain organizational unity with any "platform" other than *Minecraft* itself. This nesting capacity is part of the allure of platforms, and algorithmic life in general – the platform migrates to new locales and hardware, while retaining a kernel of its "original" aesthetic, code, and user interface.

software ecosystems that model, generate and disseminate worlds – both typifying and challenging this political economy.

Platforms have become the primary system for the creation and maintenance of economic value in the 21st century. But why did platforms, over and against another model, become the dominant economic machine for extracting, analyzing and controlling data? In *Platform Revolution* Parker et al. show that shifting out of an older model of production ("pipeline") onto the platform allows for a leveling of participants, wherein users can occupy positions of producer or consumer at different times and locations (2016, 39). Hence, "the simple pipeline arrangement [design → manufacturing → consumption] is transformed into a complex relationship in which producers, consumers, and the platform itself enter into a variable set of relationships." (6) By facilitating some core interaction like ride-sharing, through an algorithmic filter or application, participants in the form of drivers and riders are able to transfer value (e.g. money, car) across Uber's platform, generating money and data for the platform owner in the process (41). As the user base on a platform increases in size, network effects kick in, making the platform more necessary, valuable and desirable for users, and valuable for owners. The data generated becomes a mine out of which both new products and their data streams can be crafted: "*In the world of network effects, ecosystems of users are the new source of competitive advantage and market dominance*" (33, emphasis theirs). Ultimately, it this combination of global data production, argues Nick Srnicek, combined with a continued, historical decline in profitability for manufacturing that has led to the platform's ascendancy (2017, 13).

The platform didn't arise in a vacuum, and its felicitous relationship to data is the result of decades of economic changes in global production, labor and investment. In *Platform Capitalism*, Srnicek traces the evolution of the platform all the way back to the long decline in

the profit margins of global manufacturing following Germany and Japan's economic miracle in the postwar period (24). As many companies tried to revive profitability by an attack on labor unions before and during the Reagan-Thatcher years, others cut back to a bare-bones workforce to provide just in time manufacturing. (26) As the twin forces of finance and market speculation increasingly removed workers and consumers from the receiving end of pecuniary possibility, huge sums of money were now available for corporate investments that were significantly-weighted towards technological and computational ventures. Collective infrastructures built by government during previous bubbles could be built upon with the cash glut of venture capital that had been extracted during previous bubbles and from decades of globalization. In the wake of the 2008 crisis, argues Srnicek, which transferred enormous corporate debt to the public, capitalism is restructured around, "new technologies, new organizational forms, new modes of exploitation, new types of jobs and new markets" (50). These platforms, often mapped onto government-subsidized infrastructures of energy, health, education, communication and transportation are then positioned to monopolize user data and control future markets.

Platforms are so well-suited to the contemporary moment because they are intermediaries for consumption and production across every conceivable industry, continuously managing and multiplying the huge streams of data at every position. Srnicek shows that this platform model of capitalism can be differentiated into five different types: advertising, cloud, industrial, product, and lean platforms.[45] Perpetuating Srnicek's typology is not within this paper's scope, yet four

[45] Srnicek's delineation of five types of platforms is really helpful for looking at particular forms and how they function, even as they bleed into one another. Distinguishing advertising platforms (e.g. Facebook) from product platforms (e.g. Spotify) can be really helpful to find the places that data is siphoned off, and for whom. That said, most owners advance their interests past their particular type via data brokering and database purchasing. Additionally, the biggest players at the platform game (e.g. Google, Alibaba, Microsoft, etc.) are attempting to extend their monopolies into all sectors for value accumulation. By emphasizing the material-semiotic circulations within platforms, the differences across the various organizations of energies, information, bodies and understanding can be drawn out.

qualities connect his five types that help to elucidate the strength of the platform in the case of *Minecraft*. First, platforms architect a space of mediation between two parties. Because they own the ground for interaction, platform owners can surveil users as they interact with one another. (58) Microsoft has access to not only a wide range of official *Minecraft* download and usage statistics, but data streams from the official *Minecraft* Marketplace, Bing web searches, and Xbox Live information. Second, platforms necessarily lead to monopolization due to the production of network effects. As the platform becomes more valuable based upon numbers of users, it can scale very quickly, becoming necessary for its users' livelihoods (60). Microsoft's numerous acquisitions, for instance, allow them to benefit from the collation of *Minecraft* data with LinkedIn profiles, Windows OS statistics, and Cortana personal assistant requests. Third, companies rely upon cross-subsidization to balance profit and loss across their platform ecosystems. (61) For example, Microsoft can sell the Xbox One at a loss, because it ensures that users will pay the 60 dollar a year in subscription fees for Xbox live multiplayer, download games like *Minecraft* for 20+ dollars, and pay small fees over years for bonus content such as add-ons, specialized skins and maps. Finally, platforms are inherently political, argues Srnicek, "In their position as intermediary, platforms gain not only access to more data but also control and governance over the rules of the game" (61). The scale and content of Microsoft's data streams are unknowable at this point; office and database management software, computational hardware, artificial intelligence, social networking, internet search, cloud storage services and entertainment products all combine to render a future through and by these platforms. While users retain a modicum of control over the decision to buy or download *Minecraft*, and how they exploit the open play within the platform, it is but one repeating geometry in a matryoshka of Microsoft captivity.

Platform ecosystems are well-positioned to capture data, but their ability to connect the temporal cycles of play and work to both identity markers and pre-conscious scales of affect wherein they thrive. In *Signs and Machines,* Maurizio Lazzarato emphasizes that in order for capitalism's political economy to produce wealth, it requires the twin regime of social subjection and machinic enslavement (2014). The first – social subjection – is concerned with distinguishing "molar" identities (race, sex, gender, class, etc.) across the many positions on the field of labor, and enforcing hierarchies (human over nature, man over woman over child, white over black, owner over worker, etc.) within those molar conditions (35). The second regime necessitated by this political economy is what he terms machinic enslavement, which controls and regulates the body by engaging the "dividual." A Deleuzian concept for the breaking apart of the individual in the age of information, the "dividual" names the pre-subjective rhythms, affects, intensities, and sensations that aren't necessarily conscious, but are able to be able to be segmented to fit into the platform system of production:

> "Not only is the dividual *of a piece with* the machinic assemblage but he is also *torn to pieces* by it: the component parts of subjectivity (intelligence, affects, sensations, cognition, memory, physical force) are no longer unified in an "I," they no longer have an individuated subject as referent… synthesis [of the component parts] no longer lies in the person but in the assemblage or process (corporations, media, public services, education, etc.)." (27, his italics)

Architectures for enslavement, which disallow individuality and humanity, are historically and technologically present, perpetuating a long history of anti-blackness even while diffusing into a wider techno-political economy.[46] Lazzarato's machinic enslavement remains a

[46] Troubling some of Lazzarato's molar identities/hierarchies of social subjection with critical race scholars seems essential to utilizing the word enslavement here. Frank Wilderson III suggests that a hierarchy of human over nature is already a white supremacist one that is unable to recognize blackness: "In Ferguson, we can see the problem: so many people in the streets declaring 'I am Human too!'" This is symptomatic, he says, of a lack of basic

helpful articulation, because platforms function via series of diagrammatic and asignifying enunciations that, by their very repetition, enact changes upon the material bodies and relationships therein. The categorical differences drawn between enslavement and subjection show platform capitalism caught in a balancing act between the pre-subjective affects and energies of the dividual components, and the hierarchical identities of individuals fashioned for fields of production and reproduction. Yet in order to respect the lives transected by historical and contemporary manifestations of slavery, and create distance between these material violences and the pre and semi-conscious performances of the machinic, I tweak Lazzarato's concept slightly from machinic enslavement to "captivation." When Lazzarato distinguishes subjection from enslavement, he is considering the "desubjectivation" of machinic operations apart from the "megamachine" of chattel slavery.[47] With respect, enslavement fails to convey the positive affects that shimmer across the skin of content creators and gleam in the minds of designers with hope for the future. Perhaps the change in language is indistinguishable to the reader, but the deleterious consequences of platforms are rationalized precisely because of their captivating affects and captive-market effects. Captivation is both affect and effect.

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recognition: "[If] that's the first words out of so many peoples' mouths, then the unconscious is trying to tell you something about the real nature of your oppression, that even you can't handle." (15) In this particular interview, Wilderson distinguishes the policing of blackness as a form of psychic health for the rest of the world, a way of delimiting fascism and the violence of capitalism in a way that leaves the human intact: "The violence against us becomes a tactic within a strategy to secure Humanity's place. It's not a tactic in an ongoing strategy to take our land away, or to take our rights away. We never had any rights" (7-8).

[47] But the history of slavery is a downright-programmatic practice of anti-blackness, wherein physical chains are attached to literal slaves at the dawn of industry; captivity is extended through techniques of heightened visibility (Browne, 2015), programs for refusing identity (i.e. anti-natality: see Spillers, 1987), and disciplinary architectures for archiving and containing blackness (e.g. prisons, health, physiognomy, facial recognition). Lazzarato does reference the "archaic megamachine" of Egyptian slavery as the earliest form of enslavement, albeit social not technological in its assemblage. (32) Is the heinousness of machinic enslavement due to its proto-subjective manipulation, or that the quest for new and efficient forms of valuation – endemic to both industrialization and platformification – is built upon bodies that are disappeared when it "works"? Regardless, why are the material histories of black slavery absent from the analysis? While this will be considered more in later chapters, I find it interesting that more recent concerns about privacy protections, such as those emanating from the Silicon Valley "cognitariat", often extend from communities not comfortable with the networks of in/visibility, incarceration and slavery that black populations have been historically subject to.

In order to show how machinic captivity works at the molecular level, apart from individuality or identity, we require a Lazzaratoan semiology that follows expression beyond the measure of the human. His tripartite schema starts with *natural* a-semiotic encodings such as DNA (or a silicon lattice), where ""form" is conveyed by the material itself." With living systems, Lazzarato suggests, form and expression can diverge (67).[48] The two branches of symbolic communication: gesture, ritual, music, and embodied expression on the one hand, and reference, signification, and representation on the other, are included in his category "*signifying semiologies*," to illustrate how the former must be subordinated to language in capitalism (69). This will be important when we look at our circulations of *Minecraft* below, because performances – while favoring more symbolic semiotics – are often caught in a loop with processes of signification in moments of rehearsal, recitation, recording and review. The final strand, "*asignifying semiologies*," are "sign-points" or "power signs", that act upon material elements, energies, information, and diagrams, as they "slip past rather than produce significations or representation" (80). Programmers could ostensibly look closely at entire pieces of code (although this is increasingly impossible in the dominant platforms), analyzing the syntax, logic, and script-markers for clarity, but the asignifications don't represent a reality, so much as "simulate and pre-produce a reality that does not yet exist" (86). Asignifying semiotics allow me to press a green button and have a character jump in *Minecraft*, or select "save file" from a menu, and have electrons move about the flash memory drive connected to my Xbox. Asignifications can be invisible, opt-out protocols that siphon telemetry data from players to Mojang in non-GDPR countries, or can be publicly-visible and manipulable in the relation

[48] I think this a simplification of the kinds of dynamic discrepancies of form and expression that abiotic systems are capable of. He doesn't develop this much, so I can't counter with atmospheric, geological, or planetary systems whose form and expression changes with the way energy moves through the "form."

between “102.32 USD” and the Microsoft Corporation on NASDAQ on the day of this sentence’s construction. While all of the platform spaces in my schema below rely upon asignification *because* they are software systems, each corner is a mixture of symbolic, representational, and asignifying semiotics produced with and for different a/effects. [49]

The following organizational triad [**Figure 5**], which charts platforms via three circulations of bodies, energies and signs is not found anywhere other than this writing; as such, “performance, visualization, and engine” do not delimit an ontology, but are explanatorily sufficient. Internal lines do not denotate fixed categories, so much as an idealized visual space to chart differences in movement and processes for organization within the platform’s borders. All lines we fix between software and hardware, player and game, or subject and object are less helpful when beginning with the relations that differentiate bodies, energies, information, and place. *Minecraft* circulates, and in so doing it de/re/forms spaces for all manner of purposes and into all manner of shapes and roles. The 3 internal captivations – Game, Field, and Stage – teeter upon points, offering spatial metaphors for the 3 circulations. Importantly, we can chart the twin process of subjectivation and captivation of users, as they are activated in roles (e.g. as builder, modder, content creator, casual player, designer, collaborator, student, etc.) towards the “open world” of desiring-production (i.e. telos, progress, possibility, etc.), wherein value is in turn captured by the recording and analytics operations of the platform.

[49] Possible dialogue here with Latour’s concept of the immutable mobile in “Visualization and Cognition” (1985); the diagram can be transported and further combined with other forms of knowledge to accumulate explanatory power.

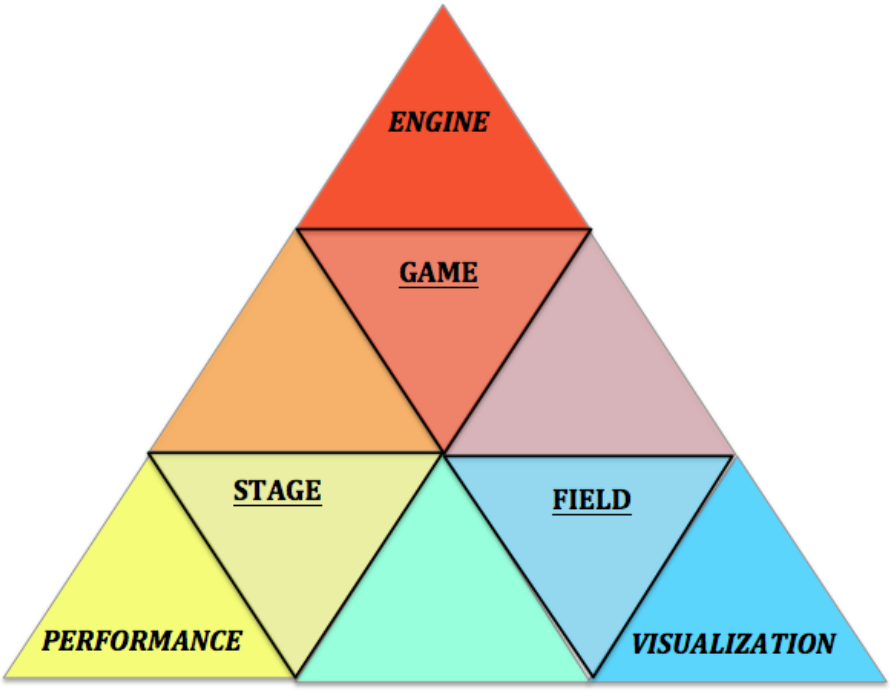

Figure 5: A Platform Mode of Production?

Engines of Change

The first corner of the platform triad maps *Minecraft* as a game platform or engine for the development of new games. Utilizing computational systems and network infrastructures, *Minecraft* has been used as a 3D graphics engine for game design – a veritable arena where new games can be played and upon which new projects can be built. The history of iteration in videogames dates at least to id Software's 1993 release of *Doom* and the editable WAD (i.e. "where's all the data") files, although arguably goes even further to the first videogames. Some of the earliest games like *Spacewar* and even *Colossal Cave Adventure* frequently migrated across university databases and labs with resulting changes being made to the games. First-person shooters like *Quake* (1996) and *Unreal* (1998) are now synonymous with the graphics engines that run them, with many more experiencing the engine than the original game.

Back in the *Minecraft* universe, Bukkit – a community-built and open-source application-programming interface (API) – was built to facilitate the creation and deployment of unique plugins and permit world editing options in multiplayer *Minecraft* servers. This software was already being utilized and "unofficially" approved by Mojang before the official release of *Minecraft* in September of 2011 (Bergensten 2011). Four of the lead developers of the Bukkit (and associated CraftBukkit) projects were eventually "brought into the fold" and tasked with building the official *Minecraft* server API in 2012 (Bergensten 2012). These software infrastructures, buttressed by networking technologies and persistent online communities for recording play and sharing mods, permitted dynamic gametypes that built upon the strengths of *Minecraft* to then chart a new course. Production begets production, as internet personalities try out officially sanctioned (e.g. Minecraft marketplace) or community-generated game types, performing them for audiences on YouTube channels and server realms, with *Minecraft* open to all possibility save for its code. Minewatch, for example, remediates Blizzard's contemporary first person shooter (FPS) *Overwatch* back into *Minecraft*, utilizing the engine's aesthetics and landscape with added mechanics and characters from the FPS. PopularMMOs, by contrast, bridges the gap between performance and game, as the internet celebrities "Pat and Jen" showcase new mods and maps. The new games are certainly the occasion, but people are also there for the personalities, attempting to convince them to play the mods themselves. An "official" example that crosses into the visualization field would be *Minecraft* on Hololens, a version by Microsoft that utilizes their upcoming augmented-reality platform Hololens to scale a game of Minecraft into your living room and engage with it like one would a box of Legos.

When asked during a Reddit AMA in 2012 whether or not he felt threatened by the MCP (Mod Coder Pack which allows game code to be decompiled in order to create mods) and Bukkit in particular, Persson responded as follows:

> "Personally, I used to feel threatened by it as I felt it challenged my "vision," but on the other hand, I also know how wonderful mods are for games. We decided to just let it happen, and I'm very happy we did. Mods are a huge reason of what Minecraft is" (LeFebvre, sic).

The corporate posture of Mojang, not open-source but an open modularity, positioned *Minecraft* as a combinatorial ground for the differentiation of new content, products, processes, bodies and desires.

While *Minecraft* was certainly a product of Notch's "vision" and programming labor, the immediate willingness to engage the community within the feedback loop combined with a hands-off approach to a rapidly-expanding secondary market in game modifications has been key to *Minecraft's* longevity and virtuality. Virtuality, importantly, is not meant to indicate nonreality, or a digital/physical delineation, but a potential that has not been fully articulated, a becoming not yet actualized into form (Deleuze 1994, 207).[50] The capacities that help frame, diagram and circulate data (e.g. VR→locative technology, or game→engine), importantly, work to change knowledge, shifting 'what' and 'how' we know, and 'who' is doing the thinking. These shifts are especially clear in the case of Microsoft's *Project Malmo*.

[50] Adrian De Souza e Silva and Daniel M. Sutko argue that a Platonic or Baudrillardian dichotomy of virtual and material was favored by new media scholars at first, due to the types of media (e.g. early virtual reality simulations) being discussed. Locative media technologies like cellular telephony, the authors argue, shifts our understanding to an Aristotelian or Deleuzian use of virtual as becoming (2011). "Therefore, rather than having two spaces that are apparently disconnected or conflicting with each other (what has been formally theorized as the technological virtual—digital simulated computer space—and what we have taken for granted as the real — physical space), the Deleuzian perspective actually allows us to understand both instances as one entity: the immanence of the real." (34) Insofar as physical space vis a vis GIS/GPS is scene as an interface to information worlds and vice versa in a dynamic entwining of topography and topology, the Deleuzian virtual resonates the strongest. While Baudrillard might emphasize the ways in which the locative media users neglect/ignore physical spaces around them when following Google maps, De Souza e Silva and Sutko make the point that in this medium geographical and digital space are intersected with, and not divergent from, one another. (31)

Figure 6: First person view of A.I. agent on left screen. Right = "Human1" view.[51]

Borne out of frustration with the simplicity of the virtual worlds used for artificial intelligence research, *Project Malmo* uses *Minecraft* as an engine for the production of sophisticated A.I. agents who can learn to navigate space with visual data (Johnson et al., 2016), draw from learned experience to approach more complex tasks (Montfort et al., 2017), incorporate other agent's heterogeneous information (Geiger et al., 2018) and respond to human users within the game (Allison et al., 2017). There is a history of using games and simulators like *Minecraft* as spaces to develop and test artificial intelligence algorithms.[52] Before *Malmo*, robotics researchers had already utilized *Minecraft*'s elegant simplicity (in a project partially funded by DARPA) for research programs. A team from Brown University designed "BurlapCraft", an API which connected the "BURLAP reinforcement learning and planning library" with *Minecraft*, in order to build mazes and train agents to navigate them (Alura et al. 2015). Project Malmo leaps far past BurlapCraft's solitary maze-navigator, as they seek to use

[51] Credit: Microsoft Corporation. https://www.microsoft.com/en-us/research/project/project-malmo/

52 This isn't the only connection of *Minecraft* with artificial intelligence. *Infinite Mario Bros!* – an earlier project from Markus "Notch" Persson – was a procedurally generated clone of Super Mario Brothers, uploaded to the comment stream of a Mario programming competition on October 6, 2006 at http://www.java-gaming.org/topics/mario-contest-public-vote/15003/view.html. Though Notch didn't win this competition (because he didn't bother to enter), his Mario clone was quickly picked up by "MarioAI" from 2009-2012. This competition used Infinite Mario Bros! as a platform to test the navigation skills of their A.I. game programs (Togelius et al., 2010). Infinite Mario Bros!, strangely enough, disappeared from the Mojang website within a month of Microsoft's acquisition, though mirrors persist online.
https://web.archive.org/web/20141007124739/https://mojang.com/notch/mario/

Minecraft as an artificial general intelligence (AGI) environment that can task agents with increasingly complex missions for experimentation. That is, beyond just optical navigation, agents become generally intelligent over time, ramping up their knowledges, and migrating across different games and eventually different platforms. Researchers argue that by using *Minecraft,* Malmo implements all eight of the criteria for "AGI Environments, Agents, and Tasks", providing a tool to keep apace with the unknowable speed of A.I. innovation. This scalability – from simple navigation to "lifelong learning" – is a design principle Malmo researchers term "complexity gradient," or the capacity for the platform to develop and enact challenges for current or future agents who may develop in unexpected directions or capacities (Johnson et al., 2016, 2). The open world, it seems, necessitates control at every level.

This balance of control with the "random" procedurally generated content (PGC), interactive system dynamics and distinct ecological biomes in *Minecraft,* not to mention the multiple streams of visual input, information transfer, and data aggregation utilized by agents, speaks to the broad ambitions of current AGI research projects like Malmo. As artificial intelligence agents learn to ambulate through the precise metric voxels of *Minecraft* space, they learn to utilize visual/optical inputs and are driven forward via the recursion of deep learning techniques (Montfort et al., 2017). Other agents learn to interact with human agents based upon gestural and linguistic signification, the training now occurring at both sides of the *Minecraft* interface. In one specific experiment, Malmo researches asked 18 children to engage with a "help_bot" in *Minecraft*, studying the undirected interactions, or human inputs, of players who sought to teach and accommodate artificial bots as helpers and co-players (Allison et al., 2017). Malmo programmers were secretly adjusting the "help_bot" in an adjacent room in order to respond to players more fluidly, but here we already see the game encircling the human and

artificial agent equally. The reflexive engine is complete: all moving is also a being-moved. If we abstracted the last experiment further, shrouding Malmo's interface behind the movement of the characters on screen, could we tell which agents were algorithmic? [See **Figure 6**]

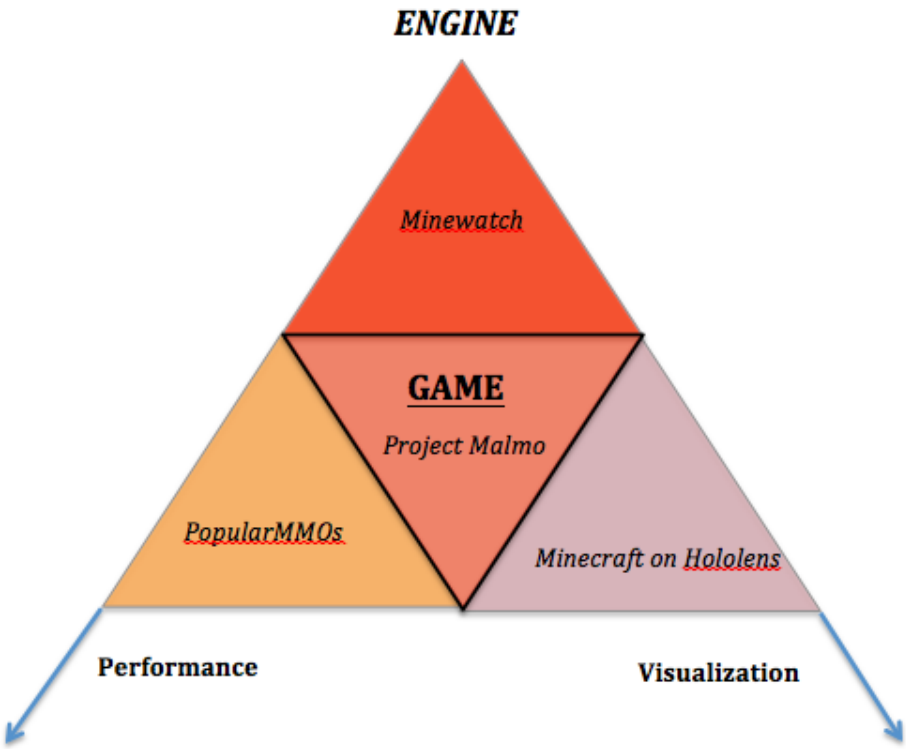

Figure 7: The Game Engine

Why term this type of circulation an engine, or even game for that matter? Yes, *Minecraft* is an open-world game, but isn't Malmo an experimental interface, or a pedagogical environment? What distinguishes this game engine corner [**Figure 7**] of the triad from visualizations or performances? First, this is a game engine because it allows for the establishment of arbitrary, inviolable rules and relationships that govern the possibilities for agents within the game. These rules are more like physical laws of the universe than cheatable rules of a poker game (DeLeon, 2013), and as such the game necessarily constrains the circulation of agents in measurable ways, indexed to material changes in computational structures. It is the game's asignifying performances that drive learning, and the acquisition of

"intelligence" based upon meeting certain win conditions. For example, an agent tests all the possible routes through a maze, and in turn "grows" their capacity to navigate future mazes and challenges. Not only are the agents driven through these mini-games, users who download Malmo's open-source platform from GitHub (now owned by Microsoft) are regularly drawn in to competitions for cash and research prizes.[53]

Driving artificial intelligence research forward requires new agents, internal and external to *Minecraft's* magic circle. This leads us to the second difference in the game engine: artificial and human agents, as well as outputs and inputs, are for all intents and purposes indistinguishable. Each output is fed back as an input for system resiliency. Or as Narcissa Wright says at the opening to her post on speed-running, "A game is input→output. Repeat." (2014). What comes to matter, is whatever the game permits upon the operator's input. If you follow Wright in imagining games (such as an individual Malmo challenge) as "a web of paths", you come to an interesting fork in the road– the subject of the game is always the game itself. The avatars in the Malmo engine are transport vectors for information circulation and accumulation; it doesn't much matter who controls them.[54] Lilly Irani has noted this reduction of human actors to user 'bots' performing piecemeal intelligence labor across the history of computing, from the earliest female "computers" to Amazon's Mechanical Turk (2011). In the game engine, the semi-intelligent task of transporting data is an artificial service that can be performed by human or AI agents, with the hope of one day arriving at universal systems for learning and training.

[53] https://www.microsoft.com/en-us/research/academic-program/collaborative-ai-challenge/

[54] Outside of a game platform, as in the case of content moderators for large platforms like Facebook or Google, the "game" remains. Artificial intelligence systems flag pages for removal or review, and "reviewers" then must determine in a few seconds (according to the same parameters) if the A.I. was right, reinforcing the system with the new output/input.

The future application goals for AGI are lofty, yet must rely upon a largely recursive architecture. This brings us to our third and final point: despite lofty goals for the future application of AGI across corporate platforms, game valuation is a largely internal and recursive affair, requiring cross-platform subsidization and venture capital to bet on future solvency. Energy enters the system through electrical wires and the labor of content creators; information enters through asignifying inputs and processing; what leaves are diagrams and models for research and future application. Project Malmo researches have hypothesized that a future direction for A.I. will be the "universal representation of the physical world", culminating in something like a cross-platform GPS pedagogical repository for mapping, sharing and integrating information, "from which each agent could derive the implications for its specific sensor and actuator configurations." (Geiger et al., 2018: 7) The accelerating nature of A.I. research dreams of intelligent systems sharing information across platforms, and transducers convert signals into motility for robotics. But for now, the system is self-obsessed, and value (like that for most gamers who spend too many hours in a virtual world) is primarily measured in terms of experience, status, or affiliation. The game's programmable mutability allows for it to elicit maximum degrees of involvement from all agents with minimal compensation. As more recent Malmo research evidences, they continue to use *Minecraft* as a ground for A.I. competition and progressive development, often built upon "human priors" to learn exploratative behavior and sequential development (Guss et al. 2021, 15). Additionally, Malmo researchers are modeling "Meta Learning Interactive Bayesian Agents" (MeLIBA), which are agents built off of general Bayesian reinforcement learning protocols, but are not model-free so that they can adapt to others (Zintgraf et al. 2021).[55] Here, the recursive training becomes a protocol to arrive at

[55] "On several environments we demonstrated that learning this latent representation by predicting future actions of other agents, and conditioning the policy on it, aallows an agent to adapt to others. We conclude that maintaining

better engines, and then circulate those models of learning outside of the game world to help A.I. engage agents, or even integrate physical limits (Sæmundsson et al., 2020).

Field of Dreams

The second direction for *Minecraft*'s growth has been in the area of visualizations, a non-neutral term for the practices of selecting, organizing and presenting (or representing) data sets, dynamic processes, or worlds unavailable to the naked eye. For example, on September 28, 2010, Ben "InternetFTW" Craddock designed and built a 16-bit arithmetic logic unit (ALU) inside of *Minecraft,* an essential component in computational circuitry. The ALU was massive – filling acres of virtual space, and it used a variety of in-game switches and conductive stone to make its calculations. While immediately useful as a tool for modeling real life phenomena, this pedagogical direction has become more common in recent years. In 2015, Microsoft began using it to teach kids coding basics, and in December 2016 Mojang released *Minecraft: Education Edition* – a licensed version for classroom use, complete with an online forum for collaborative pedagogy design and lesson plan sharing. The day before Ben Craddock's upload, Joshua "Halkun" Walker posted his 1-to-1-scale model of the Starship Enterprise in *Minecraft* to YouTube – an early example of 3D builds from narrative origins. This practice of constructing representations from other worlds reaches is apotheosis in projects like WesterosCraft – a recreation of the entirety of George R. R. Martin's fictional universe from the fantasy book series A Song of Ice and Fire. Like the aforementioned example of Verizon's in-game web browser, WesterosCraft bleeds into gaming applications in that its world represents the fictional lands of Westeros as a landscape for a new MMORPG.

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explicit beliefs over other agents helps compared to model-free approaches, especially when there is not a tight coupling between other agent type and rewards" (Zintgraf et al., 7).

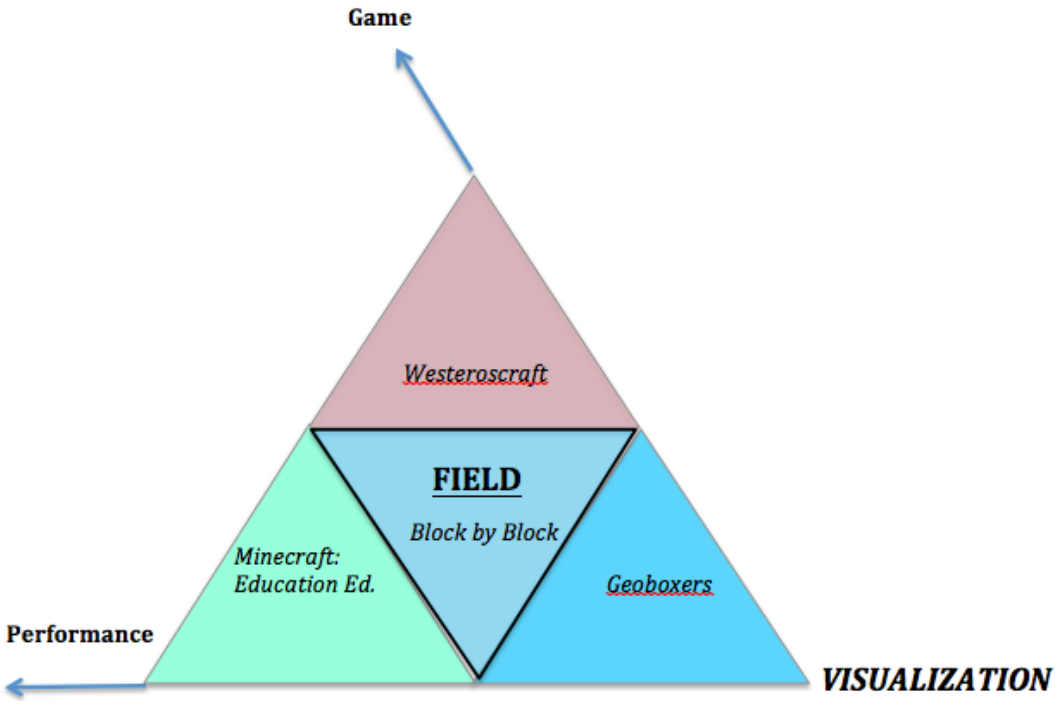

Figure 8: The Visualization Field

At the far end of this visualization territory are those that approach geographical applications. In 2014, Danish Geodata Agency employees Thorbjørn Nielsen and Simon Lyngby Kokkendorf utilized algorithms to create "Denmark in Minecraft" a project to import the entirety of Denmark to scale into *Minecraft* utilizing geographic data.[56] Following the project, the pair teamed up with Nynne Sole Dalå to form Geoboxers, a company that transforms all manner of geodata into navigable environments in *Minecraft:* "Our approach and experience opens up new possibilities to introduce the real world in gaming for education, citizen involvement, tourism…and fun."[57] Geoboxers have expanded their capacities to model in *Minecraft:* examples include LiDAR (light detection and ranging) maps of underground caves, HiRISE (High Resolution Imaging Science Experiment) camera chartings of Mars' topography, and even a

[56] "Denmark in Minecraft" was vandalized almost immediately upon its release by American hackers who smuggled dynamite into the world and blew up a neighborhood.
http://www.bbc.com/news/technology-27308555
[57] https://www.geoboxers.com/all-about-geoboxers/

simulation of the entirety of the Bialowieza Forest using SRTM (Shuttle Ray Topography Mission) data to contribute to Greenpeace's anti-logging campaign.[58] From the mise-en-abyme of computers inside of computers, to the ability to create 3D architectures regardless of fictional or topographical correlation, *Minecraft* is both a tool and a field of visualization.[59] [**Figure 8**]

Block by Block: the aforementioned partnership between UN-Habitat and Mojang begun in 2012, is aimed at providing historically-underrepresented residents in urban centers a voice in the redevelopment of their public spaces.[60] By using *Minecraft* as modeling software for existing city sites, Block by Block helps participants to visualize the space, articulate different needs and introduce new ideas into the plans for their cities. For example, in a promotional video created to showcase the redesign of a former market space in Prishtina, Kosovo, the community is shown getting together to "shape their neighborhood," designing the future look and possibility of their "unused" public spaces. "Here the authentic creativity of children, students, and residents reaches its full potential", remarks the narrator, as residents attempt to remake the future to be in line with UN-Habitat's 3 C's – that is, to design public spaces in cities that will be "compact, comprehensive and contribute to economic prosperity."[61]

[58] www.geoboxers.com/inspiration-geodata-in-minecraft/
[59] The military inflection is tangible in all 3 points of the triad. Not only the funding and technologies that allow for computational systems and global positioning to work, but the language never strays far from battle. Fields of incursion, staging grounds, war games, engines of change – these all carry particular militarized valences.
[60] http://blockbyblock.org/about/
[61] Market at Prishtina: https://www.youtube.com/watch?time_continue=142&v=CgbBnSK66NU

Figure 9: Side-by-side panoramas of playground in Kibera, Nairobi (Credit: FyreUK)[62]

Important here, is how *Minecraft* becomes a way of seeing, a method for learning, and a logic for the arrangement of big data. Block by Block creates models of urban spaces from site surveys, existing plans and geospatial maps, and translates that data into a 1:1 navigable environment in *Minecraft* that can be designed by those who will eventually inhabit those spaces. [**Figure 9**] The strength of the Block by Block program is in their collaborative workshops, which seek to mobilize community members, disseminate *Minecraft* as a visualization tool and open citizens to development possibilities and advocacy. The workshops have since been organized into a 12-step methodology that essentially teaches people how to design by teaching them how to play with the platform. Programs like Block by Block are compelling because they reinforce the narrative of the democratizing effects of technology, a claim I do not scoff at. The numerous examples evidenced across websites, news articles, and interviews with participants, speaks to how technologies with a low enough barrier for entry, can be used to provoke new

[62] At one time, FyreUK earned money through YouTube and other sources for impressive *Minecraft* builds, typically including time-lapse videos of their gigantic constructions: https://www.youtube.com/watch?time_continue=3&v=tq24xl4AB_k They were responsible for the above image, and this timelapse of the build: https://www.youtube.com/watch?v=Sg-vvRjFeEg
They eventually left to do other things, but many more Minecraft builders have taken their place. https://www.reddit.com/r/Minecraft/comments/56xioj/just_learned_that_fyreuk_has_shut_down_sad_days/

ways of looking at the world. An official statement from Celine d'Cruz, a Block by Block board member, is telling in how it continues the fantasy perpetuated since *Minecraft*'s earliest circulations: "Minecraft is a very powerful tool that **allows a community to dream**. You can try all these permutations, combinations, possibilities – you can **aspire for something more**" (Block by Block 2021, emphasis mine). Visualizations carry both an affective force "here", that often orient users in viscerally engaging ways, and an effective force, in providing explanatory utility to represent something "there."

What makes something fit the visualization corner of the triad? We saw earlier that as bodies and energies are circulated outside of the game world, such as in the case of explanatory tools or procedural methods, they slide into visualizations. In the other direction, we can see tools that model system dynamics from data sources put into a series of experiments look more like our game angle of the triad. The term simulation might fit more in many circumstances, but readers will recall I avoided parsing fictional and scientific visualizations above for the simple fact that the visualizations "work" regardless of their indexical veracity or empirical correlation. These tendencies of the image can be seen in all manner of media circulations pre-computation, but in platforms, the users themselves are caught up in the visualizations. Bodies don't have to be human, but they are "on the field" so to speak – engaged and architected by the desires the platform circulates. The processing that a platform facilitates happens in both directions, mitigating users' relationships to physical spaces, fantastical worlds, and the potential of the encircled body.[63] In *Minecraft*, a platform where almost anything is possible, and space itself is essentially fungible, the visualization corner is uniquely suited for communicating outside of the

[63] This is perhaps most evident in wearable technologies, which enable the measuring and metering of bodily states in a feedback loop of conditioning and desire. When the platform ceases to be optional – as is the case when body metrics are correlated to health insurance premiums, the vector for distributing force and governance becomes apparent.

system. Not exactly pedagogy, nor simple propaganda, but a blend of development and representation whose explanatory force is hard to argue with.

This mixing-in of referential signification to the asignifying semiotics of the game moves us beyond the simple actuator arm of physical computing, because it *means* something to observers. This ability of the image to bring-together, enact, represent, or evidence a natural world that cannot speak for itself – specifically in the realm of scientific visualizations – has been critiqued by the field of science and technology studies. Numerous scholars have pushed against these representational histories, by emphasizing the "public, practical, communicative, and textual work," that accompanies the design of visualizations (Coopmans et al. 2014, 2). But everyone in Block by Block knows the world is constructed; indeed, they are captivated by their ability to participate in the constructing! *Minecraft* (via Block by Block) is adept at taking in information, energy and attention, and in turn wrangling those forces into manipulable diagrams, which then possess both a communicative force and a provide a field for development. The visualization allows them to connect the asignificatory force of the diagram with the significations of their particular subjectivities – becoming designers, residents, or even community in-process. In the visualization, energy moves through the platform in both directions. Energy transduces to desire, and labor transforms into data at one end; at the other end, the model becomes a field for world-building, and information becomes advocacy. When the platform communicates relationships more than models, arbitrary boundaries or spatial data and begins to distribute stories regardless of information, correlation, and system integrity, you begin to approach performance.

All the World's a Stage

The final corner of the platform triad is that of a stage for performances. Stages include but are not limited to *Minecraft* as a canvas to construct voxel art upon, as mise-en-scène for machinima (e.g. The Mob Squad), as a production set for "let's play" videos like The Shaft podcast, aesthetic and diegetic inspiration to new narratives, either canonical (*Minecraft: Story Mode*), or fan-generated, or even as an advertising pulpit for new projects. With this final example, we are edging into visualization territory, but I include it under performance insofar as *Minecraft* is the theatre in which stories (of other companies, products, individuals) are told. For example, when Verizon wanted to demonstrate a functional in-game web browser and video call interface, they utilized CaptainSparklez' (aka Jordan Maron) and SethBling's *Minecraft* channels to showcase their software "verizoncraft." The graphical fidelity was humorously blocky, but staging a cellular network in a virtual world was nevertheless dramatic. Audience, reduced to numbers of views, in turn feeds-back into publicity for the advertiser (Verizon), paychecks for content creators, and the bottom line and data mine for dissemination platforms (YouTube). *Minecraft* performances typically necessitate these distribution and archiving services (e.g. *Twitch, YouTube,* etc.), relying upon spectatorial interaction to connect users across a spectrum of media content. [**Figure 10**] As we turn to Kurt J. Mac's peculiar journey to the edges of *Minecraft* in "Far Lands or Bust!", we will see that conduits for distributing content are dynamic, and the performance carries an implicit threat to *Minecraft*'s functionality.

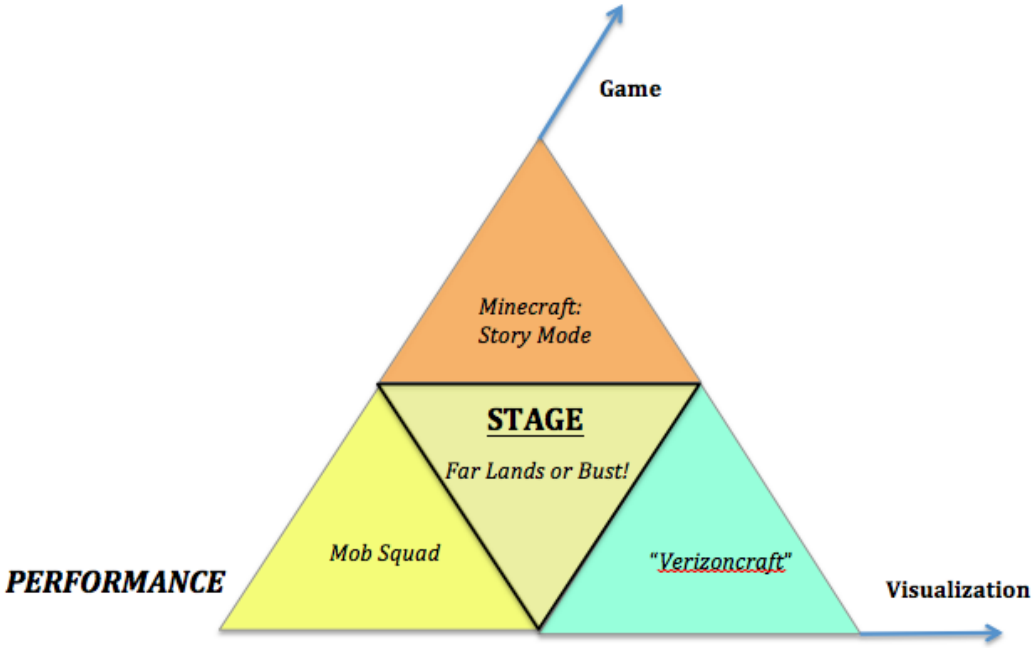

Figure 10: The Performance Stage

"Far Lands or Bust!" was commenced in 2011 and catalogues Kurt J. Mac's journey as he attempts to reach the mythical "far lands," or edges of *Minecraft's* near-infinite maps. As Mac and his digital companion "Wolfie" traipse across the gameworld, through various types of unique, repeating landscapes, Mac answers questions from his fans, comments on current events, and plugs an affiliated charity (Equal Justice Initiative, PAWS, Direct Relief, and Child's Play). The mix of in-game sound effects and music combines with Mac's running commentary to create a layered aural atmosphere between worlds. His community of fans and followers participates in this road trip betwixt spatialiaties and temporalities: they are next to Mac on his journey on Twitch, affected by his life experiences, reflective dialogue and game-related affects. Alternately, they precede him in their financial contributions, follow after his pixelated passage in the video archives of YouTube, or build alongside him in their private *Minecraft* realm on Discord servers.

The **far lands** were the name given to the inaccessible border regions of *Minecraft*, wherein players encounter an un-traversable landscape that stretches to blanket the Y-coordinate ("height") of the world. In episode 10, Mac announces that this destination would provide the telos for his YouTube series, and in episode 11 he set off west (using a compass) on an epic adventure beyond what any human would reasonably travel in the game.[64] Nice years later, at the time of this writing, Mac is in the eighth season, and episode #812 of his journey. As he walks, the world map has grown to over 26 Gigabytes on his hard drive at the time of writing (Mac 2017).[65] At the time of writing, Mac has walked over 3,116, 936 meter blocks (approximately 24.83% of the way to the Farlands) from his starting point and his fan-community has raised 407,015.38 dollars for the charity "Child's Play," and another 19,149.86 dollars for Direct Relief (Mac 2018). [**Figure 11**] The influx of capital due to monetization of YouTube channels, direct community support, and streaming revenue occasionally affords internet content-producers like Mac the opportunity to quit their jobs. While no exact statistic exists as to precisely how much Mac earns for his job as a "Let's Player", he regularly thanks his audience for making it possible to quit his job as a web designer and produce full-time.[66]

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[64] For those who are curious, players regularly engage in absurd calculations about *Minecraft.* The following subreddit debates the volume of *Minecraft* worlds to roughly 8000 times that of the earth or 88% of the sun's volume: https://www.reddit.com/r/Minecraft/comments/17wx35/the_volume_of_minecraft_how_many_blocks_can_you/?utm_source=Reddit&utm_medium=twitter This following model, by contrast, argues that current *Minecraft* worlds are each much more modestly sized, like the planet Neptune: http://htwins.net/scale2/

[65] Most *Minecraft* save files are in the 10-100 megabyte range.

[66] http://mindcrack.altervista.org/wiki/Kurtmac details one such occasion. Social Blade, a data analytics site for social networks, estimates that income from Mac's channel, if it was monetized (after Google's 45% fee) **could be** anywhere between 3 and 47 thousand dollars per year. (http://socialblade.com/youtube/user/kurtjmac [Accessed 22 March 2015]) For sake of comparison, the top let's-gamer on YouTube, "Pewdiepie," earned anywhere from 500 thousand to 9.2 million annually (Pewdiepie, Accessed 22 March 2015). While pewdiepie's (Felix Arvid Ulf Kjellberg) earnings are certainly related to a combination of factors, his performances are particularly adept at directing his audience down an algorithmically-determined path to increase impact: click on this video, look at this affiliate who will in turn promote me, etc. Until his fall from corporate grace due to anti-Semitic content, and severing of ties by Disney and Maker Studios, pewdiepie was a master at exploiting YouTube's impact-based metric of eCPM (effective cost per mille) (http://bentpixels.com/blog/youtube-tips/making-sense-of-cpm-ecpm [Accessed 6 April 2017]).

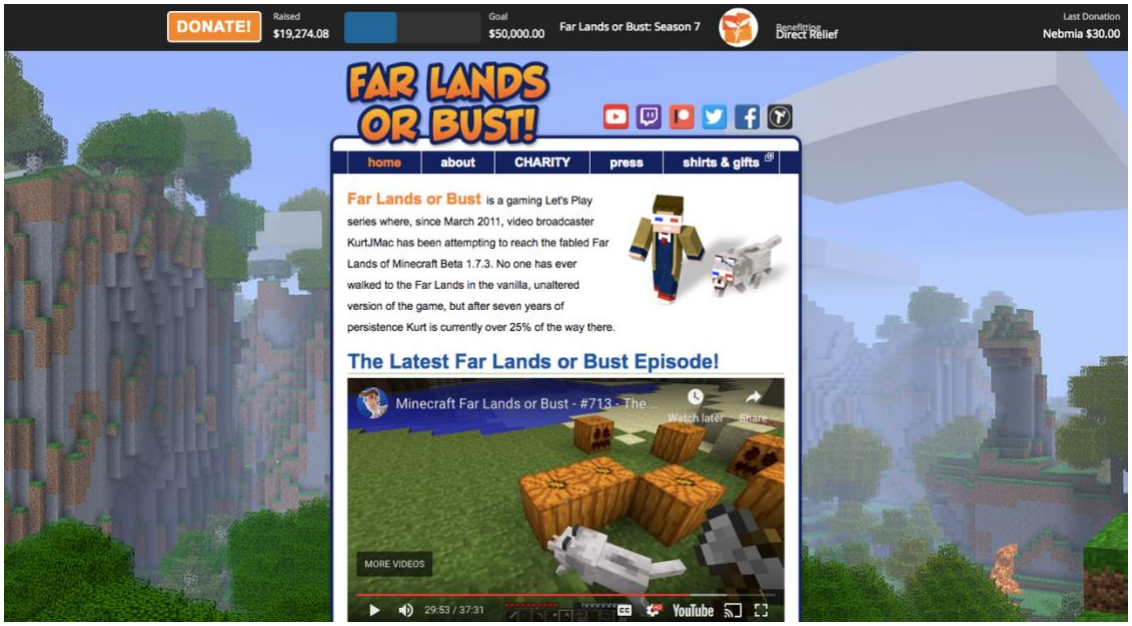

Figure 11: The homepage for Kurt J. Mac's "Far Lands or Bust" series

Instead of YouTube, Mac has chosen another platformed option to financially support his journey. In an effort to present his content free from a dependence upon YouTube and its advertising interruptions, Mac streams his episodes on Twitch, and has relied upon *Patreon* to subsidize his play since July 2014. At the time of my writing, according to KurtJMac's Patreon page, he makes an estimated 3,505.00 dollars per month through this forum.[67] Patreon is the 21st century's version of art patronage, a crowdfunding service that allows any participant to become a patron to any creator of almost any content whatsoever.[68] Graphic novelists, musicians, painters, sculptors, "let's play" vloggers like Mac, and many other creative productions with very few exceptions, are facilitated by Patreon (Mac).[69] Patrons gain access to Mac's private server

[67] https://www.patreon.com/kurtjmac (Accessed 6 April 2017)
[68] Whereas interfaces such as Indiegogo focus on large-scale single-product campaigns, Patreon creators solicit recurring donations for specifically creative activity. Patrons can choose to donate every time a maker produces a discrete piece/set of work, or allocate an amount to go to the artist on monthly basis. Like Kickstarter campaigns, member benefits scale with the contribution: 5 dollar/month earns a postcard from Mac, while the most generous contributors receive a producer credit on his site and numerous objects from Mac's merchandise.
[69] Depictions of violence, facilitating harmful/dangerous activities, hate speech, strict pornography ("artistic" nudity is allowed), are the prohibited in Patreon's Community Guidelines. One guideline I find particularly interesting is their affirmation of "authenticity." The first thing prohibited is fake activity. For instance, you can't charge patrons

and participation in members-only forums, providing a tertiary source of value and a place for an active and reflexive community of play. Beyond rewards, a shared sense that patrons are partially responsible for the completion of a project, and are contributing to a worthy cause (Mac has often termed his journey a walk-a-thon for charity), combined with their membership in an exclusive community, are a few allures of these circuits of value.

What sets Mac's journey aside as a performance? Mac's long journey, like all *Minecraft* play, requires rather banal activities such as resource collection, crafting activities, and walking. The monotony of these events added together over hundreds of episodes would be unbearable if people were following the journey because they wanted to watch someone play *Minecraft.* While Mac's channel contains diegetic remarks about the journey and its events, he regularly slides into non-diegetic commentary about what makes his journey possible (e.g. a new office chair, larger harddrive, financial support, etc.). Mac's speaking time is significantly weighted towards a variety of commentary including science facts like his love of astronomy, personal anecdotes, current events, answering community-generated questions, plugging other gaming/YouTube channels or charitable organizations, and even frequent reflections upon his daily life and interior mental state:

> "One of the main reasons I began doing this Let's play thing in the first place is to kind of… uh…and I've always said being an introverted person isn't a bad thing. You don't have to shun it away or anything. But there are some negative aspects, more on the side of social awkwardness and anxiety, that I would like to have worked on such things by starting this channel." [sic] (Episode 177).

(at least through Patreon) for promising *not* to do or make anything. Patronage, it seems, is very serious business. Other sites like Offbeatr were happy to crowd source pornography until they shuttered their doors in 2016.

The idea that you would engage a practice in order to change your body is a concept well-suited to performance studies and game studies alike. What sets performance circulation apart from game engines, is that the game's rules, environment, and win conditions are subverted to the event of the performance. Platform performances often manifest distinct relationships – between audience and performer, producer and consumer, content and container, and even between stage and life – that render's *Minecraft* an occasion for a connection. "Far Lands or Bust!" will be a lifelong journey at this rate, and those who continue to follow Mac are there for him; what happens to and through him in *Minecraft* is secondary to the relationships the performance establishes. Participants become a self-selecting community through their YouTube comments, Patreon donations, merchandise consumption, regular viewing of the journey on his website, and private participation in his Discord server where they build monuments to their shared experiences. When Mac leaves *Minecraft* to record Lets-Play videos for other games, the relationships he has developed as performer and internet personality follow him in some small measure to these alternate 'stages'.

The journey to the far lands in FLoB!, in its slow, steady procession, can be seen to frustrate the openness of the platform. First mentioned by Notch on his blog when talking about the procedural generation of terrain within Minecraft, "the far lands" enjoy an almost mythical status because they are essentially unreachable. In order for the game maps to be "near-infinite" and unique to each player – qualities which are hallmarks of an open-world game – Notch utilized 3D Perlin-noise algorithms. When a number, termed "seed", is inputted into the map generator, the algorithm combines various "octaves" of detail in order to make a noisy

landscape.[70] Mac has frequently mentioned this post by Notch on Terrain Generation on March 9, 2011 – in which he reveals the existence of the Far Lands, providing the telos for his journey begun on episode 11.

Something akin to Perlin-noise is essential for *Minecraft*, because it frustrates the perfect lines of computer visualization in order to create something that looks "real," yet does not require the drive space of a pre-articulated world. Noise here is understood as a function that combines large and small scale voxels to create fractal differences across thousands of kilometers of in-game space. The problem acknowledged by Persson is that the further you go from the map's origin point, the less consistent the position of the avatar's body is to the topographic plane. Persson made rounding errors, assuming that it would take so long to get to these spaces that no one would ever go there, and if so, the resulting "bugginess" would render the landscape essentially un-navigable (Persson). Perhaps the quintessential example of open-world gaming, *Minecraft* builds its geographical "openness" out of noise, and finds itself closed in the process.

"Far Lands or Bust!" is so interesting because we can participate in the slow eventhood of a world disintegrating. The further Mac gets from his starting point, the less synchronized both game objects and user interface are with the procedurally-generated topography. If one didn't know about the mistake from Notch, one might assume that it was merely "lag" - a disruption brought about by either high latency in the traffic of network packets or an overtaxed computer processor. Specifically, the character movement over, and interface with, the landscape

[70] There is no way to not input a number. If you leave the seed number blank, the algorithm uses the date and timestamp at the moment of "creation" as the seed number. Popular seeds are collected and shared online so that players can have access to "the same" unique landscapes, resources, and vistas.

is a fraction of a second displaced from the landscape generation.[71] The current disruption between the first-person POV and the movement of the character through the space creates a handheld camera effect. Barely noticeable when walking in a straight westward line (according to his compass), the disorienting shakiness increases as he angles between the X and Z coordinate (i.e. walking diagonally). In the future, as these little breaks increase, there is the very real possibility that Mac could either fall through the world or crash his computer, rendering his journey permanently incomplete. The problem is, the "far lands" do not exist anymore.[72] With the release of patch 1.8 – the "bountiful update," the floating-point projection problems were fixed and the Far Lands became the stuff of legend.

Kurt J. Mac lives in an alleyway, or an endangered habitat off the update path. By generating enough support, he can continue his journey through and away from *Minecraft.* He walks, generating a world-consuming map that steadily increases in size as he attempts to find a border no human was meant to reach. Mac's performance doesn't do anything to *Minecraft* writ large, as 200 million other users will still be subjected to, and captivated by their updated versions of the software. But it is emblematic of the lives transected and animated through disparate conduits of the computational platforms, which as they project worlds and synthesize thinking also contribute to ecological collapse.

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[71] This .gif shows the effect: https://d1u5p3l4wpay3k.cloudfront.net/minecraft_gamepedia/7/7d/Farlandsblockmovement.gif?version=afacf05edd70834b7d7cdedd232b5edd

[72] Or rather, finding them requires either a technological or temporal detour to either a different format – like the pocket version for mobile devices, or an earlier edition – such as Minecraft Beta 1.7.3. In theory, the far lands are still reachable, but the rounding errors that generated the glitch were fixed in all but the mobile versions. So if you start now, you can probably get there in 20 years.

CONCLUSION

Whether Amazon or Alibaba, WhatsApp or Microsoft, the lives and livelihoods of users across the globe are facilitated via a series of platformed-engagements. Software applications and hardware interfaces form a new political economy wherein access to information, social services, and public communication are only possible through matrices of proprietary technologies, end-user license-agreements, and digital infrastructures.[73] Each and every scroll, automatic login, or "send message" simultaneously activates discrete lines of code, systems of production, and apparatuses of recording, deepening the behavioral ruts of human-computer interaction, reinforcing the resilience of certain networks, and increasing value for owners. In this schema, which movements of content creators, Let's Play performers, geographers, community builders, and modders count as labor? [**Figure 12**] What about those whose play leads them to travel through the memories of users, back into archives, across media infrastructures, and forward into visualizations?[74]

[73] Since at least 2015, the number of connected mobile devices has outnumbered humans on the planet (Cisco), a number that doesn't account for the myriad personal computers, sensors, and location-based interfaces that increasingly "screen over" the sensible. In light of not just ubiquitous computing, but its accompanying reflexive sense-ability, it is pertinent to investigate the material assemblages of subjectivity and software through the environmental framing at the end of this chapter. Asymmetries of access continue to proliferate across geographical, class, age, gender, ability, and ethnic differences, yet few digital divides remain when viewed from the side of accelerating flows of information. The divide between platform owners and users is experienced vis-à-vis the digital; capitalists no longer own just the means of production, but the tools for extraction and the medium for thought. Gilles Deleuze labeled these gateways of power "the control society"; Shoshana Zuboff calls this everyday practice of extraction "surveillance capitalism"; but Lazzarato's "machinic enslavement" resonates affect a bit more.

[74] "The development of cinema appears as the historical trace of the dialectical development of capital, the material history of capital's binding of perception, of bodies, and of performative belief to its articulation of reality" (Beller 2006, 78). In the case of the moving image, it cuts out objects and circulates them in a visual market, where the value of exchange is in the factory of perception. "As all (commercial) shots become "money shots," Vertov's factory of facts gives way to the de-territorialized factories of affect/programming functioning in accord with the theory of the productive value of human attention" (79).

Circulation	**Game**	**Performance**	**Visualization**
Spatial Metaphor	*Engine*	*Stage*	*Field*
Content	- Different game Modes - Toolkits/Server Mods (e.g. Bukkit, Spigot, Mod Coder Pack) - A.I. Protocols/Agents	- Fan fiction, machinima, voxel artwork - Fictional Worlds - Internet Celebrity & Ads - Let's Play Videos	- 3-dimensional simulations - Lidar Scans - Geospatial Data - Fictional Worlds - Census Data
Production	- Mojang, Microsoft - Users, content creators - 3rd parties/affiliates	- Mojang, Microsoft - Users, content creators - 3rd parties/affiliates	- GeoSpatial Data - General Intellect from users (e.g. OpenStreetMap) - UN, States - Mojang, Microsoft - 3rd parties/affiliates
Maintenance	- Community members - Websites/forums - Mojang & Microsoft (IP holders) - Realm staff	- Content Providers - 3rd Party Providers - Archives (e.g. Vimeo, YouTube, Twitch) - Pecuniary Support Networks (e.g. Patreon, Kickstarter)	- IP holders (e.g. Mojang) - 3rd Party Providers - Content Providers/Crowds - Data Archives - International Funds (e.g. UN Habitat)
Distribution	- User websites, social networks - Corporate commodity networks - Console stores (e.g. Xbox) - Forums (e.g. Github)	- User websites, social networks - Corporate networks - Archives (see above) - Private Websites	- User websites, social networks - Corporate networks - Private Websites - 3rd Party IP Holders
Infrastructures	- Energy - Transport/Manufacturing - Internet Cable, TCP/IP - Software/Hardware/Server Farms - AI Research Networks	- Energy - Transport/Manufacturing - Internet Cable, TCP/IP - Software/Hardware/Server Farms - Patronage Networks	- Energy - Transport/Manufacturing - Internet Cable, TCP/IP - Software/Hardware/Server Farms - GPS/Satellite Networks - Governance (State/Civic/Int'l)
Value Generated?	- Status & Affiliation Products/Markets - Knowledge Work (i.e. Cognitive Capital) - Media Production (Official or Unofficial Iterations) - Data Metrics/Surveillance - venture capital ("growth before profit") - Cross-platform subsidization	- Status and Affiliation Products/Markets - Media Production (Unofficial or Official Releases) - Alternate Funding Sources (Kickstarter, Patreon) - Data Surveillance and Ads - Tax/Rent	- Status and Affiliation Products/Markets - Startup Culture (VC, poaching, hype, speculation) - Sales - Data Surveillance & Ads - Tax/Rent - Knowledge Work (Cognitive Capital)
Labor?	- Content creators (markets of affiliation) - Traditional labor - Playbour (Kucklich)	- Content Creation (Markets of Affiliation, Service Economies) - Human-as-Service (Irani) - Affective Labor (Hardt)	- Content creators (markets of affiliation) - Traditional labor - Human-as-Service (Irani) - "General Intellect" becomes IP
Example	*Project Malmo*	*Far Lands or Bust!*	*Block by Block*

Figure 12: Charting the Circulations of *Minecraft*

While I respect the experiences of users who receive (a modicum of) value and agency in such an arrangement, the "sharing economy" is a woefully inadequate expression of both the asymmetries of power and ownership that develop across most platforms. Captivation is the word for those imprisoned by, but fascinated by the possibilities of the platform. This weaving together of desire and destruction is fun in a games' open world, but downright apocalyptic when

a planetary ecosystem is driven by these machinations of extraction. No longer content with owning the means of production, Srnicek's provocative assertion is to "collectivize the platforms", using the data generated in such systems to more democratically distribute resources, garner participation, and drive development (2017, 158). In the absence of something like collective ownership of the stack – from network cables to applications – solitary layers inside the nesting doll of proprietary computational systems seem inadequate to address these inequalities.

What can a conceptual shift to framing computational systems as synthetic ecologies do to the functioning of a platform, especially when so many owners already refer to their platforms as ecosystems? The history of cybernetics has always already been a practice in rendering equivalent two sides of an analogy. This story is a synthetic one, that brought together two sides to render a future wherein the colons punctuating the differences between *organism* **:** *machine*, *brain* **:** *computer*, *environment* **:** *closed system* might become equal signs. If you recall Lazzarato's schema of signification that sought to transcend the human as organizing principle by distinguishing "Natural" Semiotics, from those that are Signifiying and Asignifying, the units of value in computational platforms start to become something like unit cells in crystallography. But instead of a form arising from the natural repetition of atomic structures, we have a proliferation of modular interconnected systems. That is, in their asignifying operations across horizontal and vertical relationships, the captivity of bodies to and by the platform machine begins to seem not only a natural expression, but also a progressive one.[75]

Can bringing awareness to the contingency at play at each point of contact in our systems provoke change in users? An affective flash or recognition of these contingent interfaces is not

[75] By horizontal, I mean those participants, agents, content creators, producers, consumers, designers, fans, etc. and not those who are positioned vis-à-vis an owner/user relation.

necessary liberating, but it does turn us back on a space, time, or body that could differ, or might never have been all along (Krapp, 2011, 86). Given the nonhuman, miniscule temporalities of computer platforms, and the comically-asymmetrical, planetary transformations they enable, events to disrupt this political economy must be material and semiotic. If *Minecraft* is indeed a platform, as I have argued, Kurt J. Mac's journey to the far lands exemplifies the Sisyphean performances required to expose these contingencies. Almost every day he embodies the pioneer spirit, journeying west to discover some unknown territory. As he moves through a system that governs the capacities and qualities of life for the gamer, he models the everydayness of lives navigated by, and inspired by platform technologies, on a planet torn to pieces by the mining and crafting compulsion of capital.

This chapter has sought to conceptualize *Minecraft* use as diagrammatic of the ecological unfolding and generative interactions that platforms facilitate, without recapitulating the technological optimisms of free access, job flexibility, and the cognitariat revolution. By following users – not as subject, individual or even human (although they could be all), but agents or vectors of transportation for other incorporations, I called attention to how capitalism has begun to reform "subjectivities" which ground power in platform ownership, evolving rent and profit for algorithmic futures. Building upon Lazzarato's notion of machinic enslavement, I have sought to follow different platform captivities, in order tease out some of the pleasures and productions in this new political economy that seemingly has no outside.

What kinds of bodies materialize and desires are mobilized through a continued repetition with, and resonating presence within, a synthetic ecology? Without rendering equivalent topological and topographical geographies, or delineating meat and digital embodiment along the real/virtual dichotomy, I followed *Minecraft* as a machine, "a system of interruptions or breaks"

(Deleuze and Guattari, 36) that operates upon diverse flows, producing the ground for varying affective, pedagogical, and spatial connections. Building upon Maurizio Lazzarato's work on mixed and asignifying semiotics in *Signs and Machines,* I have sought to unsettle human or language-centric conceptions of enunciation, charting what kinds of bodies emerge from the middle of production in platform capitalism. The triadic diagram visualized *Minecraft's* synthetic ecologies recapitulated the ground of captivity, but in so doing it called attention to the constant crossings and flows of energy and desire that the platform is continually machinating to garner value.

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Ch.3: There is No Non-Move: Bodies of Data and The Performance of Apps

On Friday, March 16, 2018, the social networking giant Facebook issued a series of press releases in advance of stories by *The New York Times* and *The Guardian* detailing the harvesting and targeting of over 50 million Facebook profiles by British political consulting firm Cambridge Analytica. In an attempt to get ahead of what would become the next day's bombshell story, Facebook's VP Paul Grewal shifted the responsibility from the social network to numerous bad actors: the developer Strategic Communications Laboratories, their PR firm Cambridge Analytica, Christopher Wylie and Eunonia Technologies, Cambridge University lecturer Aleksandr Kogan, the application "*thisisyourdigitallife*" (*Digital Life*) and ultimately, users who accepted the terms and conditions of the app. At the time, Cambridge Analytica was a psychometrics (i.e. psychological measurements) company that then boasted of having Steve Bannon, the Chief Strategist for Donald Trump's presidential campaign, on its board and was bankrolled by Republican hedge fund manager Robert Mercer and his daughter Rebekah. The company mined Facebook datasets for the purpose of psychographic targeting and voter manipulation in both the U.S. presidential election and the 2016 Brexit vote to leave the European Union. Cambridge Analytica developed an algorithm to take Facebook profile information that included biographical data, likes, posts, and responses and thereby sort users into personality types using the Five-Factor Model of personality (i.e. the "Big 5" personality test).[76] Once a profile had been mapped, the company could then generate advertisements to target users' particular fears, desires and emotions (Press, 2018). While some have questioned

[76] According to a report by BBC News, with 10 Facebook likes the algorithm could distinguish a personality type of a given user more accurately than one's work colleagues; with 150 likes, it could guess psychological types more accurately than one's own parents; and with 300 likes it is better than one's romantic partner at deducing a personality type!

Cambridge Analytica's more grandiose claims of swaying elections to a particular candidate or issue, the ability to surmise a psychological profile (i.e. real or imagined) from a particular user's body of data is an essential step in being able to move from the common and lucrative practice of micro-targeting advertisements towards the goal of behavioral modification.

Grewal responded to the breaking scandal by stating that, "Although Kogan gained access to this information in a legitimate way and through the proper channels that governed all developers on Facebook at that time, he did not subsequently abide by our rules. [2018, sic]"[77] Grewal's acknowledgement was rather remarkable: this wasn't a bug, but a feature of the Facebook platform and its Application Programming Interface (API). Facebook's infrastructure permitted this information sharing across apps, but somehow neither the company nor its employees are to blame for the malfeasance caused by developers who don't abide by their rules. In other words, this was not a data breach, hack, or leak, but the smooth functioning of their platform! News coverage focused on the potential for companies like Cambridge Analytica to influence elections, and the threat Facebook posed to users' data; largely absent was the recognition that the sociality of apps like *Digital Life* are essential to Facebook's prominence. These apps, which numbered in the **hundreds of thousands,** each enjoyed access to a capacious digital ecosystem, exchanging personal data across Facebook's Open Graph API from 2007 through the end of 2014.[78] In the wake of the Cambridge Analytica revelations, sixty-nine thousand apps were discovered to have been suspended following Facebook's internal audit; at least ten thousand of those misappropriated personal data (Conger et al. 2019).[79] Facebook's

[77] Christopher Wylie was, importantly, the whistleblower who presented the information to The Guardian.
[78] At Facebook's annual conference f8 in May of 2014, Facebook announced the plan to remove the ability for its clients, that is application developers, to harvest friend's data when you install the app. This massive update to the API gave developers a year in preparation for the removal of friend "rights" to apps (Constine & Lardinois 2014).
[79] Of note: Facebook did not voluntarily reveal the sheer numbers of these deleted apps. It was uncovered when court documents were unsealed in September of 2019 by a court in Boston conducting an investigation on behalf of the Massachusetts attorney general: "According to the court documents, Facebook told the attorney general's office

public face – Mark Zuckerberg – has since used the scandal to issue his own mea culpa, and signal (at least rhetorically) a paradigm shift towards protecting user's privacy, all while the company embarks upon a massive consolidation of their various affiliate platforms (i.e. Messenger, WhatsApp, Instagram) into a singular monolith of social communication in advance of becoming Meta.[80] Despite the short-lived "DeleteFacebook" hashtag which trended in the wake of the Cambridge Analytica scandal, billions of Facebook users continually resign themselves to a Faustian pact that promises greater connectivity at the cost of their own data's precarity.[81]

Apps socialize across digital platforms, delimiting users within a virtual space that rewards the contribution of personal data with access – to novel bodies of information, interior realities, and greater social interaction. Many of these applications are one-offs, and so conjure a strange shadowland of life which disappears almost as soon as they are generated, only to forgotten amidst a glut of new images, interactions and advertisement. Because apps are social by design, all data creation is simultaneously an act of transmission through proprietary vectors, mirroring the arrangement of financial markets. By constantly rendering possible futures in order to sell advertising space in the present, platforms such as Facebook create performative realities

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that it had identified approximately two million apps that required a close examination to determine whether they had misused people's personal data." (Conger)

[80] At Facebook's most recent annual conference – F8 on April 29, 2019 – Marc Zuckerberg half-jokingly acknowledged the many problems with his company's reputation. Repeating the mantra "The Future is Private", Zuckerberg's brief flash of public self-deprecation, similarly sought to rekindle trust in the platform's future, and leverage his user's data into a better product down the road. Zuckerberg's jokingly-contrite performance both acknowledged that they were not fastidious enough in policing their ecosystem in the past, and were the only one up to the task in the future. By repeating the central message of the congressional testimony – we made mistakes, but connection is good, so let us fix these mistakes through greater control (CNET).

[81] It has been two years since Mr. Zuckerberg went to D.C. As I sit here editing this chapter amidst the Covid-19 pandemic, the videoconferencing app Zoom is reassuring its millions of users (mandated to use the app for work communication during quarantine) that it is no longer sharing their location data with Facebook On Friday, March 27th, Zoom updated its iPhone app so that it no longer sent data to Facebook about its users' interfaces. Essentially, by "logging in with Facebook", the app was sending device data – OS, device type/model, cell carrier, time zone, language settings, etc. – to Facebook's Graph API (Cox).

for their users that, however likely, are then marketed back to them. Adam Arvidsson argues that this derivative logic operates "by constructing a 'virtual' reality composed of relations between qualities that need not correspond to the ways in which those qualities are related in the lived practice of their underlyings [i.e. users]" (2016: 7).[82] This lack of correspondence between user subjectivity or internal essence, if you will, does not change the value of multiplying and then gambling over these generative fictions. Facebook bets upon the likelihood of multiple imagined futures, agnostic to whether or not users come to inhabit the virtual reality, because the speculation is enough to sell advertising space.

Various terms have been coined to articulate the strange transformations in this new production of value that mixes together data collection, social engagement, and clickbait advertising. The "attention economy" (Davenport and Beck 2001), "immaterial labor" (Lazzarato 1996), "algorithmic citizenship" (Cheney-Lippold 2018), "control society" (Deleuze 1992) and "surveillance capitalism" (Zuboff 2019) all pull at particular threads of this arrangement of digital infrastructure, human life and accumulation. My focus, alternately, is on how apps conjoin human desire for self-knowledge and playfulness, visualize social interaction and modulate value for users and platforms through the intermediary of the API. I come at the large platforms such as Facebook circuitously, by examining how this synthetic ecology can be seen with two particular apps. First is *Digital Life,* the app that was at the heart of the Cambridge Analytica scandal; second, a now-forgotten one-off Facebook app called *"What Are Your Most Used Words on Facebook"* (*Most Used*). In this chapter, I aim to show that social media applications are integrated into larger platforms in order to multiply the **pecuniary sociality** of

[82] "Facebook is a machine for the transformation of the lived social practice into a branded sociality, composed of temporary assemblages that allow for the control and predictability of life processes." (13) This imagined, arbitrary future that the body of data works to reify in the consumption practices of the user.

both users and platforms. Put simply, the more discourse we generate in social interaction the more speculative value is produced on both sides of platform ownership. By looking at how the apps *Most Used* and *Digital Life* utilized the Facebook API to connect users to both other profiles and a personalized "self" by proffering metrics of interiority, we can see how users come to be constituted as data vehicles for digital platforms, reinforcing new political and economic asymmetries in the process. Apps like *Most Used* and *Digital Life* lure participants with the power of data while obfuscating the mechanisms that capitalize on personal communication, and reinforce a neoliberal logic of openness that requires users to "reveal more" for gains that are always to be determined.

Upon social media platforms, the act of recording (e.g. answering a quiz, like a post, naming a college major, etc.) is always an occasion of data exposure, an event wherein information is transported and collated to other indices. In quite practical ways, our bodies are deterritorialized into dynamic records, termed 'digital doubles' (Haggerty and Ericson 2000), which serve as repositories of memory, attention and even threat as they implicate their meaty progenitors. As users engage a platform, or synthetic ecology, they become subject to its financial operations; what their shadows of data (data profiles) do without them exists largely outside of any human frame of reference.[83] The horror, perhaps is best captured in the words of a

[83] This is not to say that we don't know some of the awesome and terrible things platforms do with this data, but that we often only reach awareness retrospectively. If we see, it is through a glass darkly. A social media platform like Facebook, for example, is concerned with facilitating interactions across their networks in order to both generate and suck up this data as a resource, operating according to their policies and framework. Perhaps I comment, upload a photo, or look for a new bike via Marketplace; now, my agency has increased, but every action taken provides valuable data for the platform operators. This body of data takes on a life of its own through proprietary algorithms, platform analytics and data brokerage, typically disappearing from our purview entirely until it comes back to surprise, haunt, or prove useful to our meaty counterparts. When a diamond ring appears prominently in the commercials in my news feed due to site trackers recording my digital footprints and brokering the data, for instance, we see a body of data returning to signal (and almost spoil) an impending marriage proposal. When Facebook includes numbers next to friend requests, messages, and posts at the top of a news feed, they work, visually, to mark pressing notifications. In doing so, they pull attention towards the multiplication, or extension, of previous communicative events or social discourse.

Facebook systems engineer in a recent leak, where they revealed, "we do not have an adequate level of control and explainability over how our systems use data" (Franceschi-Bicchierai April 2022).[84] While bodies of data are often anonymized (effectively reducing the individual to a random number), they have been proven incredibly easy to "reidentify", especially as more markers are added to a body of data (Rocher et al., 2019).[85] More importantly, these bodies of data exceed any subjectivity of the user as their particular arrangement, longevity and utility changes in relation to the networks they travel. This excess creates its own data afterlife which seems to have its own agency beyond users' control or recognition.[86]

Agency, in fact, is a misleading word when it comes to digital applications; we operate in conjunction with the assemblage of platform, hardware and API. Personal demographics and biographical information are combined with my actions upon the platform and are made to socialize with other users connected to me through neighborhoods of data. Neighborhoods, importantly, does not refer to geographic location, but to keyword identity categories that are often automatically-generated and niche. In a particularly pernicious example, Facebook updated their advertising tools and subsequently apologized for the inclusion of "Jew haters" as a possible neighborhood for targeted advertisements. The company had automated the creation of

[84] In Lorenzo Franceschi-Bicchierai's article in *Vice*, he quotes the engineers in the memo that was leaked to *Motherboard*, who utilize the language of open systems with recourse to an ecological analogy: "We've built systems with open borders. The result of these open systems and open culture is well described with an analogy: Imagine you hold a bottle of ink in your hand. This bottle of ink is a mixture of all kinds of user data (3PD, 1PD, SCD, Europe, etc.) You pour that ink into a lake of water (our open data systems; our open culture) … and it flows … everywhere," the document read. "How do you put that ink back in the bottle? How do you organize it again, such that it only flows to the allowed places in the lake?" Openness, once again, returns as a value that complicates the ethical responsibility of Facebook to protect users or comply with regulations.

[85] Rocher et al. is only the latest, in multiple experiments that show re-identification of digital doubles is quite easy. "Using our model, we find that 99.98% of Americans would be correctly re-identified in any dataset using 15 demographic attributes." Even when a dataset is massively incomplete, the researcher's generative graphical model could accurately re-identify an anonymized individual with only a 1% sample population. For sake of context, a typical user of health, retail, and social media services have far more than 15 demographic markers. As machine learning becomes the norm, and not the exception, the ease of re-identification renders any anonymity impossible.

[86] In the world of data bodies, we find no doppelgängers, because there is rarely a stable figure that returns to us.

advertising targets by automatically crawling through the education and work history of user profiles, including white supremacists (Wong 2017).[87] It is in a platform's pecuniary interest to continuously multiply the vectors along which these digital profiles travel, even if those vectors connect fascists to Goebbels aficionados (Dean 2019). User identity and interaction is always already imbricated with the installation of a particular app or social media platform, complicating any human capacity to perceive how afterlives of data buttress particular networks a posteriori. Because of this, it is essential to locate particular instances where this migration of data was made visible.

Applications are integrated into larger synthetic ecologies like Facebook or WeChat through the porous boundary of an API that permits various programs, services and databases to communicate with, and transfer data between, one another – lending the entire construct to a biological analogy. In what follows I will regularly refer to applications as 'microbiomes of data,' to signal this circulation between discrete socially-interfacing applications, the data collected and mobilized upon them and the larger synthetic ecologies (e.g. digital platforms) that they both necessitate and compose.[88] Most important to note, is that data microbiomes are delimited by their modular and modulating place within synthetic ecologies. For example, deleting a linked Farmville app from your Facebook page doesn't close foreclose access to your social media page. It just might, however, remove the primary social rewards you reaped within the platform, all while modulating the advertising scope or exchange value that Facebook

[87] It should be noted, that in February 2019, the LA Times tested Facebook's notorious ad targeting, and paid a mere $25 to send targeted advertisements to over 4 thousand users in a 24-hour period who were linked across keyword interests such as "Joseph Goebbels", "Heinrich Himmler", "Josef Mengele" and "National Fascist Party." Each category that Times' reporters targeted included users numbering in the hundreds of thousands. (Dean 2019)

[88] In my previous chapter, I articulated synthetic ecologies as "reflexive software environments that cultivate, break up, and reassemble flows of information, energy and material bodies." The language of ecosystems, while common parlance for speaking of technology platforms and business models both internally and externally, has a much longer history in cybernetics and economic history. Here I highlight not just this ubiquity of use across disciplines, but the worlds formed through the heterogeneous network of biological, computational and environmental connections.

received from your rhythmic return to the game. This ability to be moved and removed without the larger ecosystem collapsing, is a key piece in maintaining the pecuniary sociality of a digital platform and individuating user experience. As the apps under examination in this chapter are now both defunct, it will be important to note how alternate data microbiomes provide vectors for pecuniary sociality.[89]

Broadly conceived, *Digital Life* and *Most Used* were both viral 'quiz apps' which alternately offered metrics of personality, and visualizations of personal history to the users who installed the applications, all while leeching personal data to both app developers and the Facebook platform. If we focus upon the conscious interaction of users, these apps are simply more dynamic, viral versions of the embeddable .html quizzes that proliferated in the early 2000s across social networks like MySpace and Friendster. But following the evolution of platforms through the 2000s, developers of all stripes have come to utilize Facebook's resources such as their software development kit (SDK) and social network interface (Graph API) to develop applications that work symbiotically with the platform, capitalizing on the openness of the API to improve services, learn about users and market new products. The majority of operations in these microbiomes of data operate below the surface of visibility or consciousness; they only signal to larger ecosystems, or individual users, at the earliest moment of encounter or long after there is a problem. At the center of these (and other) quiz applications is the desire to know oneself, and reap miniscule social rewards through performing metrics of a self. Like the

[89] On April 25, 2019, a little more than a year after the Cambridge Analytica scandal, Facebook updated their platform policies [Image 11] in order to restrict apps with "minimal utility", like personality quizzes, from utilizing the platform. (O'Neil) Problem solved? In a little over a decade, Facebook had become so adept at maximizing the pecuniary sociality of users and apps, that it took an event of Cambridge Analytica proportions to question the value of these practices. The change to their policy might have removed apps like *Digital Life* and *Most Used,* but it has the result of rendering invisible this history of data performance that lies at the heart of platforms. Users are now protected from 'frivolous apps' so that the core operations of data-collection can proceed obfuscated by the utility of the well-designed application.

imaginative uses of *Minecraft* in the previous chapter, desire here is both fed back as a valuable experience for the user, and is in turn captured by the platform to generate value.

Digital Life

Digital Life (i.e. "*thisisyourdigitallife*") was a Facebook-enabled application, developed by Cambridge psychology lecturer Aleksander Kogan. In 2014 Kogan's company Global Science Research (GSR) payed approximately 270 thousand digital workers, many of them initially drawn from crowdsourced labor on Amazon's Mechanical Turk, a few dollars apiece to take a personality quiz and harvest their results (Davies 2015). The quiz (available at University of Cambridge's Psychometrics Centre), asks test-takers to mark the level of accuracy of various statements in order to determine one's personality type.[90] Answering "Neither Inaccurate nor Accurate" to statements such as "I sympathize with others' feelings", for example, would help to plot the user within the "Ocean", or "Five-Factor" Model of Personality [**Figure 14**]. At the exam's conclusion, one's percentage of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism would be displayed [**Figure 14**], and further opportunities were provided to append demographic information for forwarding to Cambridge's Psychometric Centre. What a great many contributors didn't realize about "thisisyourdigitallife" was that just by installing it onto your profile, the developer would gain access to your friends' profiles, location data, friend lists, birthdays and page likes.[91] Even if the original user understood the impending dataveillance (i.e. data surveillance: Roger Clarke, 1988) of their friends, there was

[90] https://discovermyprofile.com/miniIPIP/introduction.html

[91] It is important to realize that *Digital Life* is not the exception to the rule, nor even the only example affiliated with the psychological measurement tools established by Cambridge University's Psychometric Center. In fact, two days before Zuckerberg testified before Congress, CNBC reporter Michelle Castillo discovered that the company CubeYOU, had been conducting "academic research" and then selling it for marketing purposes using the Facebook quiz app "You are What You Like." While that app no longer exists, and was suspended by Facebook as part of their wider investigations, their subsequent app *Apply Magic Sauce* continued this pattern of datamining personality markers through the Facebook platform.

importantly no notification of this collection to those friends enrolled by users who clicked "I accept." Approximately 87 million Facebook users were eventually determined to be affected by this data leeching. The data from Kogan's study was sold to the British behavioral research company Strategic Communications Laboratories (SCL) in 2014, the parent company of the PR firm Cambridge Analytica, breaching Facebook's platform policies in the process. The data, however, had an afterlife that survived long after Facebook demanded its deletion in 2016, when it was discovered to have influenced Ted Cruz's re-election campaign (Davies).[92] When Donald Trump advanced in the 2016 presidential primaries, Cambridge Analytica worked to designate the best targets for the candidate's digital ads, fundraising appeals and locations for in-person visits (Rosenberg 2018). SCL additionally took the psychological targeting data to affect the outcome of the Brexit vote, using Facebook's platform as the ideal deployment mechanism (Cadwalladr 2017). If my readers have misrecognized where or what this body of data is amidst the numerous acronyms of this data-dealing shell-game, this confusion further exemplifies how afterlives of data work across time and space to exceed human scales of reference.

[92] Despite initially denying their use of the data, Alexander Nix, the CEO of Cambridge Analytica subsequently claimed to have influenced Donald Trump's election campaign on a hidden tape (McKee 2018).

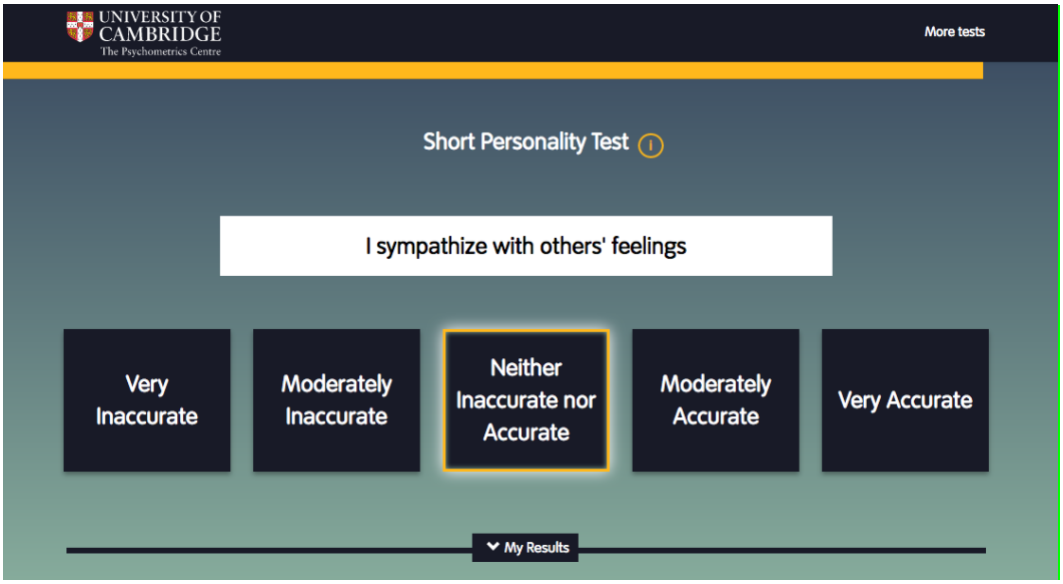


Figure 13: Format of the "Short Personality Test" from Cambridge's Psychometric Centre (Credit: Author)

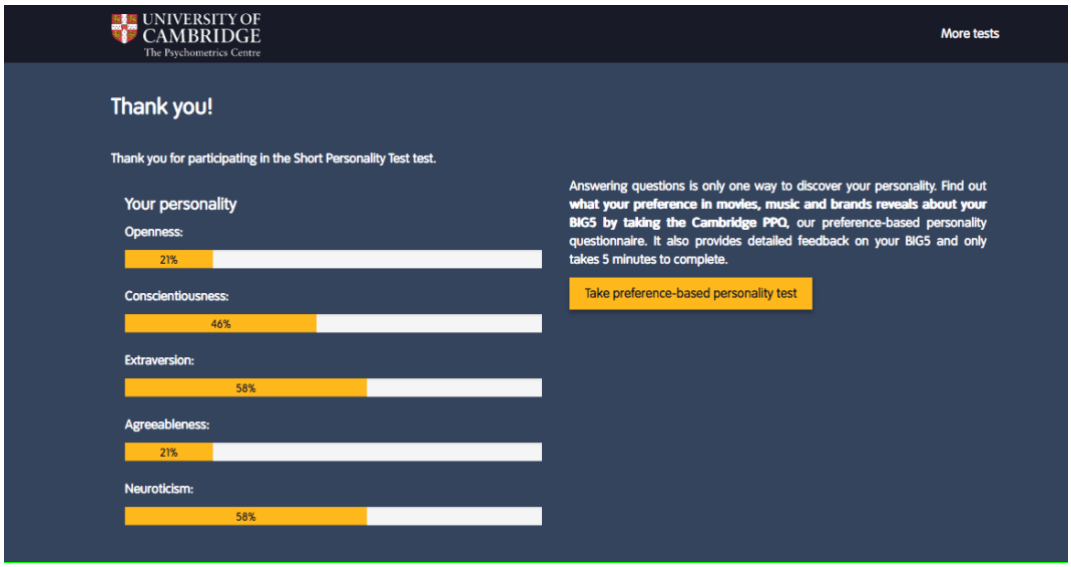


Figure 14: Results from clicking "Neither Inaccurate nor Accurate" on every question (Credit: Author)

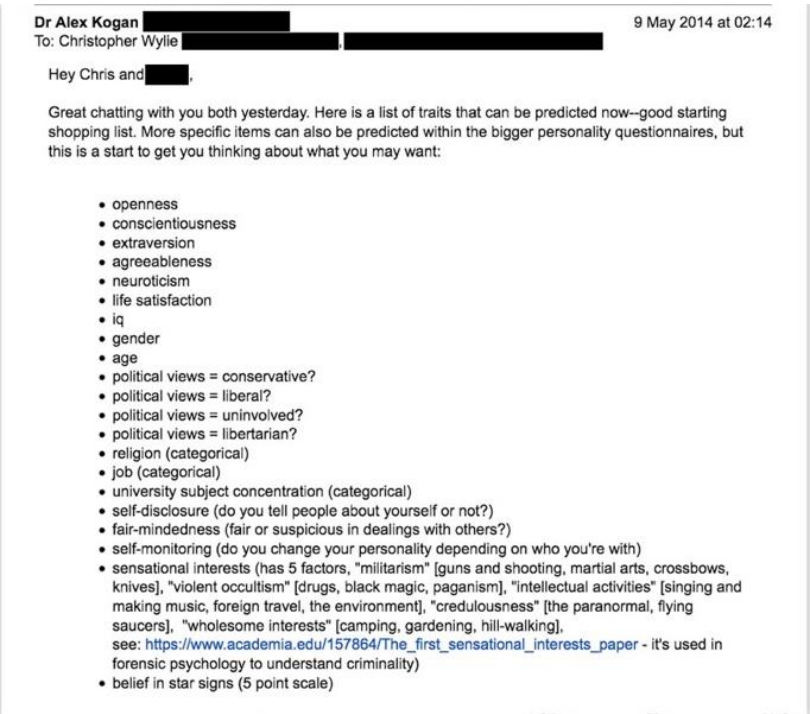
Digital Life enabled users to dynamically engage data about themselves and post it upon their timeline through the utilization of Facebook's Open Graph API. APIs allow software engineers to standardize how a computer function can be called upon, whether or not each engineer knows the precise location of the function, or how the black-boxed algorithm works.

Digital Life enacted a sieve of data in accessing Facebook's graph, which obeyed proprietary boundaries when leeching information back to Kogan. In fact, copying the data to SCL, Cambridge Analytica and whomever else is the extent of his misconduct. User desire for self-knowledge/exhibition, together with a small reward, was gamed into a massive data collection whose socializing value drastically exceeded any exchange of funds. With the combination of personality-test answers and data from Facebook's Graph, Kogan boasted of his ability to predict everything from a user's demographics, to their political leanings, consumption habits and social behaviors [**Figure 15**]. This new body of data works reflexively upon the rhythms of users to establish new political arrangements, proffering the capacity to trigger political actions, regardless of its correspondence to truth.[93] User's bodies, both as recipients of political targeting, and as bodies of data collaborate in this new type of power, creating an arrhythmia between the body in meat and its digital doubles. Arrhythmia, adapting Henri Lefebvre's work on space, signals a malfunction or desynchronization between the lived body and the body of data moving at meters and across scales not selfsame.[94] For Lefebvre, "pathology…is always accompanied by a disruption of rhythms," and these breaks provide occasions to analyze and intervene in relations that are typically only felt (2004, 68). All rhythm involves "movements and differences within repetition", but arrhythmia – in the case of *Digital Life* – can be seen when the irregularity between the body of data and the body of the user creates an infelicitous pairing that threatens

[93] While advocates such as Cory Doctorow have rightly questioned the fecundity of Cambridge Analytica's imagined "persuade-ability", the now-commonplace targeting of populations through surveillance technologies is what enabled these problems in the first place. In the wake of data leaks, election hacking and the rise of extremism, Doctorow argues that it is not a mind-control, but a corruption problem with Facebook: "For commercial surveillance to be cost effective, it has to socialize all the risks associated with mass surveillance and privatize all the gains" (2018).

[94] For Lefebvre, rhythm is such a helpful tool of analysis, because it conjoins quantitative components and qualitative practices in situ: "**Rhythm** reunites **quantitative** aspects and elements, which mark time and distinguish moments in it – and **qualitative** aspects and elements, which link them together, found the unities and result from them" (2004: 9, emphasis his).

the livelihood and self-determination of the body (90). The body continues to repeat along familiar rhythms (e.g. scrolling through news feeds at breakfast, liking friends' pics mid-morning, adding a new app to your phone or profile in the evening) while the data continues to syncopate past those moments of conscious attention and into future arrangements. While *Digital Life* is quickly forgotten by the user who downloaded it in 2014, the data continues to work and be worked outside of the lived experience of the original user – successfully locating them as advertising target, yes, but also within an ecosystem primed for emotional triggering. When Congress finally acts in 2018, the data has already performed across an untold number of networks and for political purposes far exceeding the knowledge of the original parties.



Dr Alex Kogan [redacted] 9 May 2014 at 02:14
To: Christopher Wylie [redacted]

Hey Chris and [redacted],

Great chatting with you both yesterday. Here is a list of traits that can be predicted now--good starting shopping list. More specific items can also be predicted within the bigger personality questionnaires, but this is a start to get you thinking about what you may want:

- openness
- conscientiousness
- extraversion
- agreeableness
- neuroticism
- life satisfaction
- iq
- gender
- age
- political views = conservative?
- political views = liberal?
- political views = uninvolved?
- political views = libertarian?
- religion (categorical)
- job (categorical)
- university subject concentration (categorical)
- self-disclosure (do you tell people about yourself or not?)
- fair-mindedness (fair or suspicious in dealings with others?)
- self-monitoring (do you change your personality depending on who you're with)
- sensational interests (has 5 factors, "militarism" [guns and shooting, martial arts, crossbows, knives], "violent occultism" [drugs, black magic, paganism], "intellectual activities" [singing and making music, foreign travel, the environment], "credulousness" [the paranormal, flying saucers], "wholesome interests" [camping, gardening, hill-walking], see: https://www.academia.edu/157864/The_first_sensational_interests_paper - it's used in forensic psychology to understand criminality)
- belief in star signs (5 point scale)

Figure 15: Screenshot of email from Aleksandr Kogan to Christopher Wylie describing the traits he claims to be able to predict. (Credit: *New York Times*)[95]

[95] https://www.nytimes.com/2018/03/17/us/politics/cambridge-analytica-trump-campaign.html

Mr. Zuckerburg's highly-publicized journey to Washington is analogous to the layers of obfuscation enacted by apps like *Digital Life* and their apologists. In his ritual of contrition before Congress, Zuckerberg's testimony masked over the political operations of his platform. "My top priority has always been our social mission of connecting people, building community and bringing the world closer together", said Zuckerberg at the conclusion of his opening statement before the U.S. House of Representative, "Advertisers and developers will never take priority over that as long as I'm running Facebook" (C-Span3, April 12 2018). His apology seemed to satisfy a Congress unclear on how to address an event that whose pastness didn't preclude the haunting presence of data's afterlife. While a small percentage of affected users had accepted *Digital Life's* terms of service, and Facebook had previously permitted app developers to garner this data, those events had long since passed. What was to be done? Notable was Senator Maggie Hassan (Democrat from New Hampshire) who keenly articulated the lingering tension between the bottom line of Facebook and the privacy of users on their platform, saying, "I'm concerned that Facebook's profitability rests on two potentially problematic foundations… maximizing the amount of time people spend on your products and collecting people's data." Zuckerberg deftly countered with internal statistics indicating that increased time on the Facebook platform was correlated with increased wellbeing, because users were not passively consuming content.[96] Throughout his testimony and interrogation on Capital Hill, Zuckerberg positioned himself as both concerned about securing the platform (e.g. "We're reducing the data you give an app when you approve it…", or "Our sophistication in handling [threats] is growing and improving quickly."), and as the only ones positioned do anything about it (e.g. "we

[96] With this interactive fallacy, for lack of a better term, Zuckerberg makes it clear that bringing the world closer together and increasing site traffic are commensurate (C-Span3, April 11, 2018). As Facebook has pivoted to "Meta" this last year, the circumvention of any culpability is clear. If digital assets can be fungible, and mapped to physical ones in augmented realities, then time spent in physical worlds also doubles as time spent on the platform.

deployed new AI tools that proactively detected and removed fake accounts", or "if we find that someone is improperly using data, we'll ban them and tell everyone affected") (C-Span3, April 12, 2018).

Other than a sweeping sense of the technological ignorance of many in political office, the consistency to the series of congressional questions fell mainly along partisan lines regarding questions of censorship and regulation. Senators from all political stripes lacked basic information about how not just Facebook, but how cookies, targeted advertising and even the internet functioned. Examples abound, but centered upon Congressional misunderstandings concerning how Facebook makes money. We don't sell information to 3rd parties, Zuckerberg repeated frequently, but we sell access to neighborhoods of customers. The typical Republican response celebrated Facebook as an American success story, and while cautioning against overregulation, sounded the alarm for Facebook's purported censuring of right-wing speech. This notably prefigured many of the debates that have continued following the 2020 election. Ted Cruz, for example, trotted out the example of Diamond and Silk, two vocal supporters of president Trump who had accused Facebook, without evidence, of being censored. The worry here, is that right wing speech is censored on the platform at a higher degree than the that of the left. While no good research exists to back up this conservative talking point, there continues to be a high rate of censorship on Palestinians, Antifa and Q-Anon (Gostoli 2018, Lovelace 2020). Despite the grandstanding, Facebook's capacity to crack down on certain stories or political figures is quite apparent, and their editor/publisher role is becoming more common (e.g. Washington Post's Hunter Biden & Burisma story in 2020, Trump's Facebook suspension in 2021). Another thread, albeit less consistent, came from Democratic senators, who broadly focused on the many instances of Facebook's violations of privacy and hinted at regulatory

oversight. This response, however, struggled to articulate a thread or compelling vision for anti-trust and regulation that Zuckerberg hadn't circumvented with his acknowledgments in his opening statement. Like the banks post-2008, Facebook had been caricatured as too big to fail, because who else could monitor all of this content. Zuckerberg's expertise, foregrounded against a backdrop of Congress's technical naivete, hand-wringing over censorship's distribution, and confusion about the appropriate response, largely neutralized a regulatory change or financial punishment that would befit the scale of the media platform.[97]

In the aftermath of the Cambridge Analytica reporting, which Facebook had coordinated with the timing of the Congressional hearings, Facebook sent out messages to users indicating if their data have been compromised by "thisisyourdigitallife" [**Figure 16**], and set up a website to help them search to see if banned apps had access to their data.[98] But absent was the acknowledgement that ALL apps on the site had this access prior to the lockdown on their API friend-sharing at the close of 2014. Users responded with a mixture of humor and furor, often laying the blame not on Facebook, but on the unknown friend who compromised their data.[99] But the virality of quiz apps like *Digital Life,* or *Most Used* means that critical awareness typically comes after the click, accept, and share. By locating the blame on individuals in *Digital Life,* an understanding of the application's dynamic performance is subsumed to its existence as faulty technological object [**Figure 17**]. Users somehow bear all of the risk, yet reap very few rewards from their participation in this world of pecuniary sociality.

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[97] In this pure political theatre, Zuckerberg – as a metonym of Facebook – provided a face to hate amidst his public conciliation. But by sticking to a largely scripted testimony and preempting their questions with a strategy to address the past crisis, he retained his authoritative voice as the face of the platform. Who else to better monitor and manage the ecosystem than he? Furthermore, by revealing very little new information about the Cambridge Analytica scandal, the issue could be painted as the work of bad actors who didn't follow the platform's policies. The public ceremony provided a catharsis for users, who having no real power other than to delete their accounts, had to defer to the expertise of the concerned benevolent face of Facebook and an infrastructure outside of their scales of redress.

[98] https://m.facebook.com/help/1873665312923476?helpref=search&sr=1&query=cambridge+analytica

[99] https://hellogiggles.com/news/facebook-this-is-your-digital-life-app/

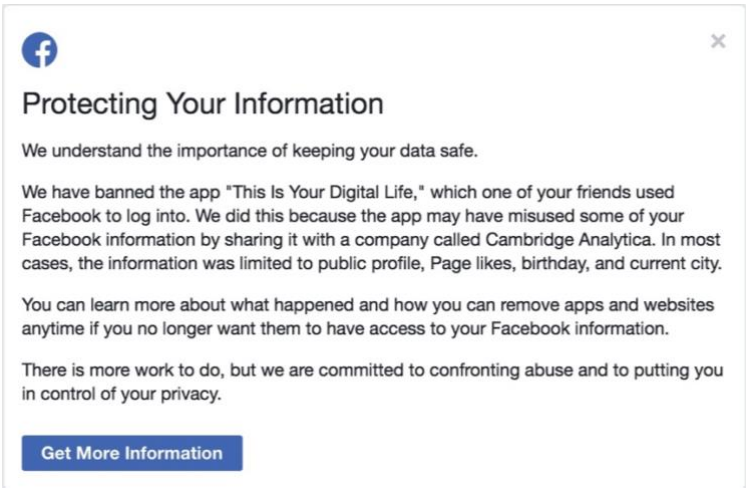

Figure 16: This notification was distributed to users on April 9th, 2018. (Credit: Facebook)

Figure 17: This post publicly shaming those anonymous individuals who logged into *Digital Life*, sharing this user's data in the process, was far from unique (Credit: Dani Deahl).

While both Krogan's app, and Cambridge Analytica's political maneuvers are certainly nefarious in their intentionality and operation, the public scapegoating helps to deflect attention from the machinations of all applications utilizing the Facebook API. If the scandal was essentially a 3rd-party data leak/theft, and Facebook can honestly claim to have never sold user information to 3rd parties, then the only thing the company has to apologize for is making the world too open and connected. When Marc Zuckerberg testified before Congress, his performance was largely concerned with this task of assuaging the public as to Facebook's benevolence. Despite the eventual fines Facebook received, Zuckerberg succeeded, and, in displaying the relative ignorance of political leadership as to what applications do with personal data, remains the imperfect choice to address its problems. Despite all of the rhetoric, Facebook maintains a distinct homology with *Digital Life's* methods and the goals of Cambridge Analytica. That is, their data mining operations were so formally-indistinguishable from one another, that at times they were synonymous. In fact, the shared ancestry has only become more explicit as Zuckerberg has refused to take down political ads that have been shown to be demonstrably false (Zuckerberg, December 2019).[100] Cambridge Analytica was selling the capacity to target and trigger bodies through infecting social imaginaries; while the company is defunct and the data ostensibly deleted, this process is one that Facebook continues to enable.[101]

[100] When asked to comment on *CBS This Morning* about the permitting of false political ads on their platform, Zuckerberg responded: "At the end of the day, I just think that, in a democracy, people should be able to see for themselves what politicians are saying." When interviewer Gayle King pushed him with "even if the ads are containing false information…" Zuckerberg interjected, "I think people should be able to judge for themselves the character of politicians." His equation of free speech with false speech is an instrumental one, and reveals that what matters is indeed shareholders, not the kinds of communities that are being built and buttressed with his platform.

[101] Beyond the daily trickle of content organized upon personalized newsfeeds, or updates from friends and shared pictures from loved ones, the Facebook application is so compelling precisely because it compels. Like the word "application" itself, compelling is always a doing, not just a quality of the social network. With Facebook's slogan of "making the world more open and connected", or more recently their pivot to, "the future is private", we have to assume that there are infrastructural realities and algorithmic operations that are either in play or being developed for these purposes. The recent aspirational future of the platform, announced at F8 – wherein Facebook is touting a redesign and integration of Instagram, Messenger and Whatsapp to be end-to-end encrypted – are meant to reassure users with concrete examples of their technological evolution while never revealing what was "under the hood" that

Triggering through Open APIs

Digital Life enabled users to dynamically engage data about themselves and post it upon their timeline through the utilization of Facebook's Open Graph API. Since the 2000 release of eBay's developer toolset, APIs that are open, i.e. their data protocols favor interoperability and data-sharing with 3rd party developers, have gradually risen in prominence: Google and Amazon followed suit in 2002, while Twitter opened in 2006 and Facebook in 2007. Because APIs allow access to platforms for app developers agnostic to the algorithm's content or syntax, they have become one of the most important interfaces for the transfer of data at the outset of the 21st century. Robert Bodle argues that in opening APIs, a few central companies accelerated the ad-funded monetization of the internet. Opening the API, states Bodle, allows "software ecosystems or networks of alliances built around their social media platforms to compete in boundary wars over the control of social media flows." (2010: 326) We consider the app *Digital Life* pernicious, because the far-reaching effects of that particular dataset were incredibly publicized and seemed to revolve around contentious issues (e.g. Trump's presidency, Brexit). On face value, users took personality tests and shared those with their friends and family on their Facebook page. *Digital Life* siphoned data for Kogan, but all of that data was always already collected by Facebook's ecosystem. With the average daily users of the platform still numbering around 1.7 billion, and the average time 58.5 minutes per day, the number of data crossings on Facebook's API must be beyond reckoning (Mohsin).[102] *Digital Life* was just one of many (at the time) personality apps that had access to Facebook's Graph API before the 2014 changes. When considered in

was violating privacy in the first place. In this way, Facebook is but one of innumerable examples of applications that are black-boxed, allowing avatarial capital through interface customization yet denying any access (or knowledge) of its working parts. Knowledge has to be deduced from daily engagement with the application and the observation of its socio-political effects. User's desires are engaged by these systems daily, in ways that intersect corporate goals and material performances with the contours of the technological imaginary.

[102] *Monthly* users top 2.3 billion.

conjunction with apps for fitness, recipes, health, music, education, politics, directions, news, sobriety tracking, video streaming, messaging, website analytics, internet browsing, internet search, and all manner of social media content, we see an entire world of material interaction utilizing APIs to transfer personal information outside of human perception.

While the extent to which a company (e.g. Cambridge Analytica) is able to sway an entire election using social media campaigns should rightly be interrogated, the capacity for Facebook and its applications to serve as a social catalyst should not be in question. In 2014, the paper "Experimental evidence of massive-scale emotional contagion through social networks" was published on the website of *The Proceedings of the National Academy of Sciences.* The authors, all members of Facebook's Core Data Science Team, argued that their research proved that "emotional states can be transferred to others via emotional contagion, leading them to experience the same emotions without their awareness" (Kramer et al., 8788). They evidenced this contagion by manipulating the emotional content of posts in the news feeds of approximately 155,000 randomly-chosen Facebook users in 2012. They discovered that users who were exposed to either more emotionally positive, emotionally negative, or less overall emotionally-expressive content tended to be correspondingly-influenced to be more positive, negative or less expressive (8789). Facebook was either oblivious or apathetic to the ethical violations of such blatant social engineering, claiming informed consent was given via the data use policy in their license agreement! Setting aside, for the moment, the fact that the majority of people who accept license agreements do not read them and view them as a nuisance for digital access, experimenting with the emotions of a population without their knowledge clearly an ethical violation (Obar & Oeldorf-Hirsch 2018).[103] In the public response to the debacle by Sheryl

[103] In Obar and Oeldorf-Hirsch's study, they find that most users typically skim Terms of Service (TOS) and Privacy Policies (PP) in about a minute, even though they would take on average 45 minutes to read both. The authors

Sandberg, the Facebook COO argued the problem was in how the research was communicated, not the surreptitious analysis of millions of posts, or the pilot program for social engineering (Carr, 2014). Evident from the study, is not only that Facebook has been capable of invisibly swaying the emotional state of its now 2.4 billion users for at least 10 years, but that they consider it standard operating procedure.[104]

The practical ability to not just target, but trigger users throughout the day is often publicized through a discourse of ethical prevention, but it reveals the user as fully enmeshed in a digital apparatus for captivation. Google's "Redirect Method" is one clear example of socially-engineering not just platforms, but users, into a pre-established route for political purposes. In 2019, Patrick Berlinquette detailed how he was able to utilize this project – first deployed in 2016 to sway Isis sympathizers away from extremism – to redirect Google searches for "ways to commit suicide" towards prevention hotlines and resources. By intervening with alternative content at various "micromoments," that is, the average 150 mini-events (e.g. searching, scrolling, clicking) that people conduct on their devices daily, Google had been able to sway roughly 320 thousand "Isis sympathizers" to view half a million minutes of video that challenged Isis ideology. Despite the laudable goals of deterring terrorism and suicides, the author acknowledges this engineering capacity as a slippery slope, as "the standard of what needs to be

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slipped in ridiculous clauses which stated that they would give the NSA all of the user's data, and assign possession of the user's first-born child to their company as payment (2012, 11-12). These statements were missed by 98% of their readers.

[104] The use of social platforms to not just target, but trigger their users, is an exercise in what Shoshana Zuboff calls *instrumentarian* power (2019). Users susceptibility to this networked form of power increases with the multitude of activities online, facilitated by companies like Google and Facebook. In terms of scale, Facebook's information collection is staggering, and indicative of the many streams of surveillance to which users have little recourse or control. Siva Vaidhyanathan, for one, argues that not only does Facebook open users up to collection by the platform itself (and its many affiliates), but it facilitates surveillance from peers and governments. In his estimation, these three streams make Facebook, "the most pervasive surveillance system in the history of the world." (57)
https://www.parliament.uk/documents/commons-committees/culture-media-and-sport/180514-Rebecca-Stimson-Facebook-to-Ctte-Chair-re-oral-ev-follow-up.pdf
https://theoutline.com/post/4578/facebook-is-tracking-you-on-over-8-million-websites

deradicalized is adjustable" (2019). Architecting internet searches to lessen the risks of terrorism and suicide to users is avowedly social engineering, and quite quickly can be deployed into all manner of other fields. Outside of any public or regulatory oversight, these methods are almost certainly occurring right now, in untold frequency, across platforms and applications. Negative or positive content about certain populations or practices, can be, like a commodity, both advertised, and reordered. Additionally, controlling access to information by determining who might sympathize with certain beliefs via keywords is not only inherently subjective, but it reorders identity around a set of database practices. That is, as Helen Nissenbaum says, because we have put so much faith (and venture capital) into the values of information aggregation, mining, analytics, and big-data prediction and behavioral modification, we have, "catapulted information – raw and processed – into a starring role in social decision making" (2010, 44). This becomes increasingly problematic as measurements of data activity and even site-traffic become targets, a common problem referred to as "Goodhart's law." Users in such an arrangement are like the dendrites to the neuron's soma, serving as the transport mechanism or data actors within informational architectures. These moments of platform decision-making and social engineering are unseen, however, because interface with a platform is oft filled-in or masked by the application layers in the networking framework. Precisely because apps like *Digital Life* are installed within larger platforms, their capacity to modulate affect and multiply pecuniary sociality often obfuscates this algorithmic power that exists one level down.[105]

[105] The immense power held by social media companies such as Facebook, has necessitated a series of public performances to reconcile users' platform experiences, and negative publicity from a litany of violations and leaks, with the promise (and necessity) of the brand. In the wake of the 2018 reports on the Cambridge Analytica scandal, for instance, Facebook's Chief Technology Officer Mike Schroepfer appeared before the U.K. Parliament on May 1st as one of the many appearances by the company's leadership, in order to answer questions about the social media giant's influence on elections. Following the hearing, Rebecca Stimson, Facebook's Head of Public Policy, sent a letter to the House of Commons which included data on the scale of her company's online presence. In it she stated that Facebook's "Like" button appeared on 8.4 million websites, the "Share" button on 2.2 million sites, and

Social media platforms are always on the lookout for ways to increase time spent upon their platform so that they might garner value from the viewing, liking, and circulation of data. They can increase signal traffic a number of ways, from developing new services in-house (e.g. Marketplace) to buying up external competitors and bringing them into the fold (e.g. Instagram). Both of these methods have the tendency to increase network effects (i.e. highly-trafficked networks increase users which makes the network more necessary and so on), but at a cost. With apps like *Digital Life*, platforms stack developer content directly onto their platforms, which essentially multiplies signal traffic for free. Facebook data flows both ways in these cases, with the user becoming the essential transport mechanism between app developer and platform owner through the medium of the API. In fact, this multi-directional flow is what distinguishes the form of platforms from the older "pipeline" model of business. When talking to *Fortune* senior editor David Kirkpatrick in conjunction with the May 24, 2007 announcement that Faceboook's social network was converting to a platform, Mark Zuckerberg said, "We want to make Facebook into something of an operating system so you can run full applications." Sixty-five different companies including Microsoft, Amazon and Red Bull, launched 85 applications at this announcement event; within less than 6 months that number had ballooned to seven thousand, with approximately 100 new ones added daily (Rampell). Apps like *Digital Life* are central to the success of platforms, because the content is dynamic, they integrate easily into Facebook's proprietary API architecture and they collapse the shifting desires of users directly into data

"Pixel", the free "invisible" analytics tool for website owners that also logs data for Facebook, was installed in almost a million more.
https://www.parliament.uk/documents/commons-committees/culture-media-and-sport/180514-Rebecca-Stimson-Facebook-to-Ctte-Chair-re-oral-ev-follow-up.pdf
https://theoutline.com/post/4578/facebook-is-tracking-you-on-over-8-million-websites

generation.[106] It is users that are the switching stations, or infobiotic vectors, for the transport of data across these dataveillance networks.

When users installed *Digital Life* within Facebook's platform, they opened a door to particular arrangements of information, complete with goals that exceed their own, and stimuli that are not selfsame in origin.[107] Siva Vaidhyanathan explains how the design of social media applications to be social and pleasure-generating, "trumps any effort to build or spread civic responsibility into the systems" (51). This is due largely to an intermittent reinforcement of social behaviors that are affect-laden. Following author and journalist Cory Doctorow's lead, Vaidhyanathan uses the term "Skinner box" to liken Facebook's machinic generation of pleasure to an operant conditioning chamber (36).[108] These apparatuses, famously developed by behavioral psychologist B.F. Skinner, were used to condition animals to engage in repetitive behaviors. Skinner's work was concerned with instrumentalizing animal behaviors by using a data-driven approach to behavioral systems. In other words, by modifying environments with appropriate stimuli, certain responses could be conditioned: "We need to establish laws by virtue of which we may predict behavior, and we my do this only by finding variables of which behavior is a function" (Skinner, 8). If all of the variables could be mapped, certain reflexes could then be targeted. Reflex responses in a mouse could be conditioned, for example, when a lever pressed by the mammal delivered a food pellet. If the response is only periodically

[106] This apps, or widgets, are what Catherine Rampell calls the coins of social media value. In exchange for some service, function or bit of fun, users exchange personal information. Writing at the outset of the Facebook platform's rollout, Rampell interviews an app developer who typifies the approach to users at the time: "Privacy is not nearly as much as a concern as being able to use a cool application." https://www.washingtonpost.com/wp-dyn/content/article/2007/11/02/AR2007110201894_pf.html

[107] Importantly, you can't install *Digital Life,* as it has been removed from the Facebook platform. It simply does not exist. This systematic elision of the data trail is important to the kind of power exerted by platforms, as deleted applications, developer updates, changes to interface design, and alterations to license agreements render it near impossible to reconstruct events from the side of the user.

[108] https://www.youtube.com/watch?v=RAGjNe1YhMA Published March 22, 2011. Accessed August 1, 2019

reconditioned, i.e. occasionally reinforced with a positive stimulus (e.g. food pellets, "likes", comments from friends), the subject will remain at a "fused state" where the behavior perpetuates even if most reflexes return unrewarded (117). Social networks are physical, not metaphorical, analogues to Skinner's conditioning, as they allow users to connect with valued friends, family, and coworkers, making ever present the possibility of positive reinforcement and pleasure through interaction. Vaidhyanathan terms these "potato chip pleasures," and argues that they are key to the appeal of a platform like Facebook. Users post, read, connect and engage their communities in ways that are irregularly pleasurable. This recurring, but discontinuous, conditioning is synonymous with rats pushing levers in Skinner's experiments, or a gambling addict pulling the crank on a slot machine (38, See also: Natasha Schüll, 2012). Instead of pushing levers to receive food (or shocks), users send updates, click touch screens and receive notifications in steady, albeit uneven intervals. Operationalizing these social reflexes require systems that are more distributed than Skinner's simple box, but their performance is remarkably similar.

Semi-conscious user interaction forms an essential link for the surveillance of data and the flow of information betwixt apps and platforms. Users generate content and establish connections: the consequences of this self-evident statement have not been adequately understood.[109] It is users who create pecuniary sociality by adding apps to acquire utilities,

[109] Moments of agency punctuate Facebook's system by providing an opportunity to act, or express self-determination, before our digital doubles comes back to direct us towards something we may want to buy, or distract us with links that also serve as mines of data extraction for the platform. My visible actions, like the tip of an iceberg, account for a mere fraction of the mass of the algorithmic responses, backend analytics and nonhuman organization and storage of information which lies submerged from view. Let's say I choose to enable Facebook's pixel on my personal Wordpress page, so that I can collect analytics on the visitors to my site and serve them with content that is more apropos to their desires and demographics. With pixel installed, "my" agency has increased again, as I can review the basic analytical tools that Facebook provides in order to improve my website in this mise-en-abyme of dataveillance. But pixel, as a line of code, is quietly and perpetually running whether or not I check it daily, weekly, or quarterly. It forms an automatic link in a much larger chain of Facebook analytics, serving the company's data mining efforts, and enabling them to get much larger "neighborhoods" of data (my website and its

entertainment and means of self-expression, all while opening up untapped markets and multiplying occasions for data collection. *Digital Life* is one important example amidst a flood of these socially-imbricated apps. *Digital Life* provided communicative and affective value to its users, while serving as a stage for the enactment of data (Raley 2013). In order to identify oneself amidst a spectrum of personality characteristics (e.g. neuroticism, extraversion, etc.) we perform a multitude of interactions which build connections and bodies of data at once.[110] Quiz apps provide a unique way to go deeper, proffering a metric of desire, belief and personality itself, creating a "data real" out of the app-facilitated imaginary. Anonymity disappears in such a surveillant assemblage, yet the resulting image is multiple. On the one hand, app users are visible to governmental and corporate actors as precise, demographically-parsed targets. On the others hand, user are rendered from a shifting nexus, or cloud of representational content – particular histories, desires and interiorities are brought into form at the bequest of the app.

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metadata), all while forming a much more complete picture of the individual users that have visited my site. It would be a mistake to default to the human mode of surveillance here and imagine computer eyes watching everything that happens on my page or on my website. Instead, we should remind ourselves of the Universal Turing Machine, and the real strip of paper on which anything and everything that one does is written, with a control box that can move across the top to read together any bit in any order or combination. What served as an act of agency in installing Facebook's pixel within the limited scale of my webpage, also became an action of subjection to the machinations of the application.

[110] Rita Raley shows that these data bodies are "repeatedly enacted" as a result of our activity online, tracking cookies, and the reconstruction work of platforms, advertisers and developers. In practice, users can very quickly be moved from one classificatory tag to another. *Digital Life* users move from advertising target to scandal victim overnight. "Data is in this respect performative", Raley argues, "the composition of flecks and bits of data into a profile of a terror suspect [for example], the re-grounding of abstract data in the targeting of an actual life, will have the effect of producing that life, that body, as a terror suspect" (2013, 128). Raley further shows that in such a regime of dataveillance, users have to become experts in navigating architectures and widgets, "to the point of identification" in order to route around them (134). In most cases it is unnecessary to click on any social widgets for them to record site traffic, as it is registered automatically. **This is not surveillance in the human mode: you are not watched so much as your presence accumulated.** Facebook's dataveillance occurs in addition to the vast numbers of tracking cookies and the resulting analytics embedded on almost every web page. For sake of illustration, a random Yahoo news webpage that I just clicked on contained 16 tracking analytics running on it from various companies. I can see this information only because I use an application called "Ghostery" installed in my browser, which I trust to monitor these types of trackers on my web browser. This invisible surveillance neither provides users a vector to consciously travel along, nor does it provide an icon to indicate its loitering. Routing around this everyday surveillance increasingly requires a systems-familiarity that makes refusal an act of going further down the rabbit hole. Smalls acts of everyday acquiescence to the inevitability of this surveillance solidify the rhetorics of connectivity and openness, not to mention the many tethers of affect generated through greater connectivity.

Facebook applications like *Digital Life* are illustrative of how social media platforms need to weave together the logic of pecuniary sociality with the pleasure of an interior made visible. Because human bodies occupy a central place in the links of repeating stimuli and reflexes, occasions for manufacturing engagement must be multiplied to garner affect as pellets of social value. Economists and critical theorists alike have coined the term "attention economy", to articulate how the measuring, understanding and managing of attention with conceptual models and technological tools has become essential to contemporary business practice (Davenport and Beck 2001). Jonathan Beller notes the consistency between this so-called attention economy and earlier circulations of capital such as that found in industrial assembly lines. Just as Fordist economies consume labor power to transform matter into commodities, applications necessitate bodies to "exchange time for image", creating virtual neighborhoods that can be sold targeted advertisements: "We cut, edit, produce, direct; we watch, we process, we wait" (Beller, 79-80). While the phrase 'attention economy' certainly articulates the new digital infrastructures of stimulation, I think it fails to signal how this these "click events" – the smallest unit of pecuniary sociality to be siphoned off by platforms and shared across affiliated applications – are selfsame to the moments that tie behavior and access to self-knowledge. This behavioral instant is never a simple dyadic struggle between user and platform, as applications like *Digital Life* treat the body of the user as a vehicle for delivering the body of data. It is significant that Kogan initially utilized workers on Amazon Mechanical Turk, who are payed fractions of a dollar to complete "human intelligence tasks" to install *Digital Life* upon their Facebook page. This service approach to not only data, but human intelligence, points to how the search for self-knowledge is always already operationalized by the logic of pecuniary sociality.

Users pay and are paid in data for dynamic encounters with an invisible "self" conjured at the interface.

Most Used on Facebook

"What Are Your Most Used Words on FB?" (i.e. *Most Used*), was a 'quiz' from the company Vonvon that would search one's Facebook content in order to generate a data visualization.[111] [**Figure 18**] Only a week after the app had been introduced into the Facebook ecosystem, privacy advocate Paul Bischoff showed the application to be a morass of personal privacy issues and network effects. By installing the app, users granted the company access to not only to their identities (name, picture, age, sex, birthday), posting history, photos, education history, location, hometown, IP address, the user's history of "likes", and information about the device used (computer, tablet, phone), but also one's friend's list and any photos they shared that had tagged the original user. Similar to *Digital Life*, this act of sharing did not necessitate consent from the affiliate parties (Bischoff). Activating *Most Used* immediately spread to one's social contacts through a visualization on their timeline of their friend's cloud, the only signal of this invisible siphoning off of data. While Vonvon promptly defended this extensive dataveillance by assuring customers it didn't keep or sell their data, this event prefigured a multitude of privacy concerns concerning personal data metrics, which would later be uncovered in the Cambridge Analytica scandal.[112] This mixture of proprietary data about data, infographics which generated excitement both *in* and *for* the viral moment, and a culture of platform-enabled,

[111] I use the term quiz here loosely, even though users are not answering any questions or making any selections outside of the choice to install the app. When they accept the terms, the quiz generates both the questions and the answers from the past actions of the user upon Facebook's platform.

[112] Perhaps Vonvon really does delete its user's data the moment the tag cloud is generated, and Facebook might consider the privacy of its users to be important in the wake of Cambridge Analytica. Regardless, every use necessitates an implicit trust in the application, given the opacity of license agreements and the invisibility of data.

information exhibitionism is exemplary of the promise and problems of modern software applications.

Figure 18: "My Most Used Words on FB" (Credit: Deepa Lakshmin)

Vonvon, a Korean social media company whose name means "loyalty" (i.e. according to their quiz, "What does your name mean in Korean") makes popular internet quizzes that can be shared across Twitter, Instagram and Facebook.[113] In 2015, the company raised 3 million in venture capital, led by Altos Ventures of Silicon Valley.[114] Their first viral success in the U.S., with the 'quiz', "What are Your Used Words on Facebook?" racked up over 17.5 million users

[113] I've taken the "What does your name mean in Korean" test a few times. Sometimes it says loyalty, trust, charisma, and perseverance. It seems that the quiz "translates" the English word to Korean by randomly assigning a word with positive symbolic value, all while collecting user data from the visitor to the site. If you choose to share with Facebook, it takes advantage of Facebook's Social Graph API to log you in. Facebook gets a login event and any data posted to its site, and Vonvon acquires you're the unique social data from Facebook's API.

[114] https://www.forbes.com/sites/amitchowdhry/2015/11/29/the-most-used-words-facebook-quiz-app/#3771f08b2d94 Vonvon's executive team, according to Pitchbook.com, is comprised of Jongwha Kim (CEO/Founder), Dongmin Kim (CTO), and Min-Joo Yoo (Head of Russia/Brazil Development). https://pitchbook.com/profiles/company/126913-15

within its first week in November 2015 (Pullen). While numbers dropped precipitously after that initial moment, their website currently claims to have 200 million monthly visitors, 1.7 billion pageviews, and 44 million shared posts from their every-growing repository of quizzes.[115] The company maintains that they don't sell information to 3rd parties, and their revenue is currently generated through a combination of advertising and branded quizzes developed in conjunction with corporate partners (O'Brien). While they have established expiration dates for their retention of data, the ability to log in to their site via 3rd parties (via Twitter, Facebook, Instagram), and the extensive use of cookies on their website, complicates the "where" and the "what" of this unretained user data. Companies like Vonvon are positioned right at the interface of user desire and corporate interest, and they trade playful and problematic representations of self and personality, for access to the afterlives of user data.

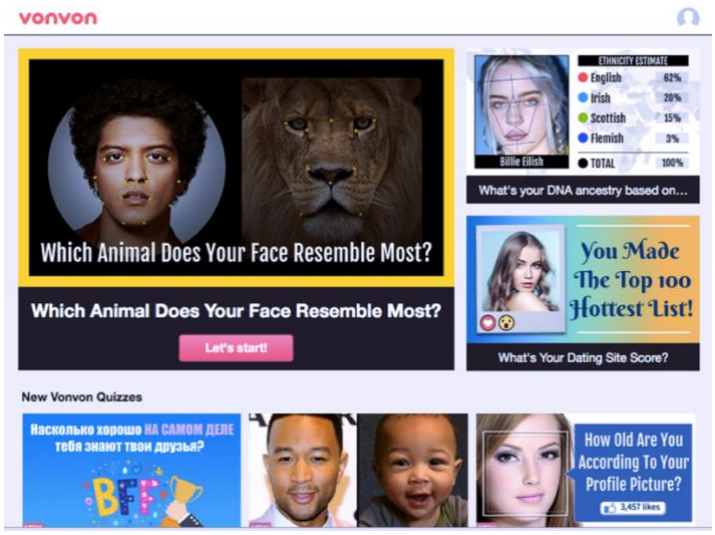

Figure 19: Screenshot of Vonvon's homepage at time of writing (Credit: Johnson)

[115] https://en.vonvon.me/about

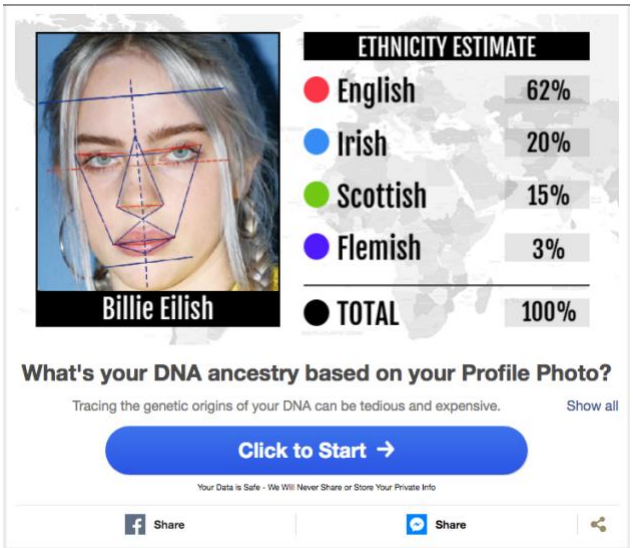

Figure 20: "DNA Ancestry" Quiz

At the time of writing, the company's home page was randomly populated by large rectangular boxes containing the most current quizzes [**Figure 19**]. Each quiz typically contains a similar combination of image and text, with the majority utilizing photo quality images and titles of what the quiz offers. For example, the quiz, "What's your DNA ancestry based on your Profile Photo" contains the photo of Billie Eilish, overlaid with a facial analysis map reminiscent of Bertillon's physiognomic tables, and placed next to an estimation of ethnicity [**Figure 20**].[116] While some quizzes offer similar face-play (e.g. "What did you really look like as a baby?"), others necessitate data crawls with Facebook's API to deliver their results (e.g. "Who is Your Soul Mate?").[117] Still others help users to search what their name means in various languages or holy books, consult a potpourri of crystal ball predictions based on their answers within question

[116] These type of physiognomic or anthropometric quizzes appear quite regularly on their website. Additionally, Vonvon's partnership with FaceApp – an application which allows for the generation of realistic facial transformations – multiplies the types of quizzes available that manipulate the face of the user.
[117] Both "What are Your Most Used Words on Facebook?" and "Who is Your Soul Mate?", two of their most popular quizzes which generated their results by capturing huge amounts of personal data, have since been deleted from their site. The excitement conjured in the viral moment quickly dissipates, but the data remains. But in what form?

trees, or even map personality types to particular user selections. These interactions, while silly and puerile, belie the way the site's organizational structure renders equivalent platform scraping, user interaction and photo uploads. That is, allowing access to your Facebook feed, uploading a personal photo, or clicking answers to a pre-formulated quiz are different means to a playful end for the user and data mining for the app. The ever-changing assortment of quizzes, which carry different data concerns and privacy relationships depending upon the type, blend together in their mundanity. Following each quiz, Vonvon provides users the option to share the quiz results to their various social networks.

Most Used engaged users so effectively because like Facebook it viewed "social" engagement (e.g. sharing a post) as synonymous to 'associational' operations. By building upon indices of the past Vonvon was able to give form to users' desires for self-knowledge in a forum that produced social engagement. Past social activity was the grist for the associational mill, which in turn was fed back into social activity. Furthermore, as interiority is given shape in data, the conflation of associational dataveillance and exhibitionist social activity is completed. I use the word "Thanks" a lot, so I must be a grateful person. The correlations just spiral from there – as one's self-image can be associated with a celebrity photo, or my answers to psychometric questions evidence my personality type; all associations then are made to socialize with other troves of data, regardless of veracity.[118] Truth is not the operant term here, but possibility. Many of Vonvon's quizzes allow users to "try out" different answers and then curate the results so that they arrive at an ideal version of "self" to share with their network. These theatrical self-presentations work in concert with one's updates, likes and comments on other friend's pages

[118] Recall in my previous chapter how visualizations of entirely fictional worlds can be rendered just as faithfully as topographical data from LIDAR scans. Imaginary worlds can be correlated in afterlives data just as easily as medical measurements or declarative statements upon one's timeline.

and across numerous platforms to provide an image of the user, replete with iconography (artwork, celebrity likenesses, graphs of "data") to bolster self-exhibition. Accompanying declarative statements like "You are Artistic and Imaginative" allow one to gain a foothold in a possible (outside-in) sense of self, regardless of empirical or experiential historicity [**Figure 21**]. Apps like Vonvon multiply the occasions for these hybrid human-machinic productions, and yet there are few positions from which one can garner a complete view. Users have very little understanding of what the information generated looks like, or where it goes, outside of the graphic-user interface and the image posted to their social network.

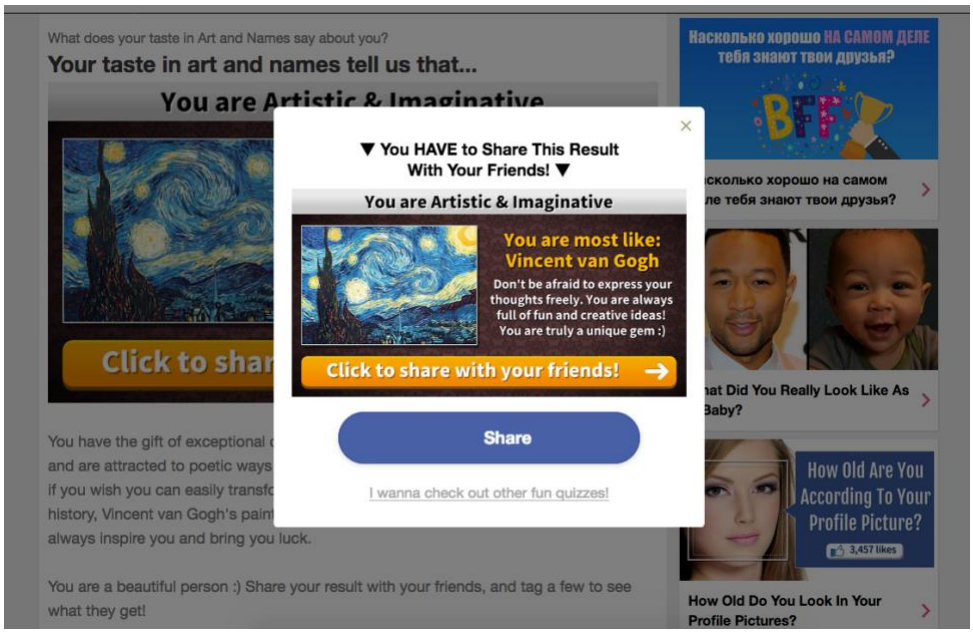

Figure 21: Each quiz is created to be disseminated immediately upon one's social networks.

The spread of *Most Used* was a viral event that occurred entirely upon Facebook, and it yielded returns at a computational scale that exceeded the lived, or attentional, time of the 19 million users who gave the app access.[119] In the infrastructure of platforms and apps **there is no**

[119] The reader will note, I am probably using application or "app" contrary to their typical usage. While I will develop this further in the subsequent section, it is important to note that I am speaking of the programs and services

non-move: every link, like, or "do not show me this" operates within and reinforces a logic of dataveillance. In such a logic, resistance is catalogued to make the system more internally resilient, profitable for the owner and captivating to the user.[120] In internet-marketing lingo, these many moments of pecuniary sociality are labelled "calls to action," and they are aimed at "conversion." *Conversion* is the act of turning someone from a mere browser into a product user, contributor, purchaser or subscriber. For the word-cloud generating app *Most Used*, conversion happens the moment in time where users grant Vonvon access to their Facebook profile data. At that moment, the application ceases to perform an advertising (i.e. proselytizing) function, and instead becomes an interface to worlds not observable before the access was granted [Image 9]. As recording becomes synonymous not just with storage, but with generating new bodies of data, human perception is not simply playing catch-up. We can only access these new bodies through the interfaces that perpetuate this recording/enacting loop. Vonvon's aestheticization of frequent word-use is a relatively banal example, but the visualization condenses time across the network and makes it present not as time, but as an icon. Mark Hansen argues that, "we now live in media environments in which synchronization with experiential time – or, more precisely, with the long circuits of lived experience – no longer constitutes the dominant function of technical media"

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that work across an API in order to interact with the larger infrastructures of a platform. "App," here, is meant to call attention to the many thresholds or services through which a user passes.

[120] Refusal is not an option here, because it counters the infrastructure of social networking platforms, the way they occupy the internet, and the very design of the applications that run on top of them like software on a computer. As we see in the case of Vonvon's "What Are Your Most Used Words on FB?", the Facebook A.P.I. Open Graph multiplies connections via a protocol which allows webpages and other apps to connect through Facebook, even logging in by utilizing your Facebook password. The sociality of apps themselves in turn enlarges the data stream that Facebook can surveil and monopolize. Users certainly benefit due to the ability to move seamlessly across applications, but their movement accrues value for larger platforms and bring with them the increased risk of personal data leaks. Perhaps, in your daily use you don't click, and only pause at an image, quote, or video. That too is recorded: to train algorithms and A.I. agents, to index a machinic memory, and to habituate ourselves in concert with computational architectures. Avoid Facebook altogether? Not really possible as the Share button, a simple white "f" against a circular blue field – the heraldry of the platform era – is emblazoned atop most news feeds and innumerable highly-trafficked web pages. The ubiquity of tracking, which quite literally pushes and pulls data to and from a user's devices hundreds of times per day puts users in an absolute position subservience to the application interfaces and the platforms and hardware upon which they run.

(2015, 41). The Lumieres' cinematograph displayed the movement of bodies and trains for human eyes, and Marconi's telephone transmitted the voice to human ears across great distances in real time. But Vonvon processes huge archives of the past into an instantaneous image. For Hansen, our awareness is always playing catch-up, and in fact often comes through the very systems that have provided us with this insensible data (2015). Users are quite literally 'out of time', as they come into focus through these moments, and find themselves enthralled by the self-constructions displayed back to them. I earlier termed this *machinic captivation*, because users simultaneously experience an ambivalent mixture of affects in response to being captured, analyzed and displayed.

For many, the reward is worth the risks. There is a pleasure in seeing oneself, and having others see, even if we don't always know who or how we are being seen. When I was in high school (@1995), my friend was circulating a paper quiz he downloaded from the computer lab called the "Anti-Celibacy League's Purity Test." During class, between breaks, or after school he would slip an individual the test, which consisted of 100 questions about every sexual activity a person could imagine. In fact, many of us learned new sexual terminology purely from the nomenclature on the "quiz". People would mark down their answers (Yes/No) on a separate sheet of paper and then tally up how many times they said yes. Then, you would tell him your score, which he added to a list at the back of the test before handing it off to the next person. So on a list of names, Colin = 86% Pure, means at 16 years of age I answered "yes" to only 14 of the questions. Your name "stuck" to the list, but within a context that was simultaneously safe and titillating in its social exhibitionism; each participant's specific answers were never known and only so many people could see the results. Friends would hypothesize about what each other did/didn't do as the list garnered names and scores, not to mention ambiguous social value along

the way. Others would try to improve their scores over the weekend, using the test as a catalyst for losing their virginity or trying something new. The sharing of the test scores, regardless of the intimacy of revelation, or risk of being caught by teacher or parent, was significant to the determining of sexual identity within my social group. Regardless of any empirical or statistical correlation, the quiz both served as metric for sexual performance, and importantly, circulated as a register of social capital. As such it evidences the type of social value that platforms such as Facebook attempt to make pecuniary. When one jumps media from a paper quiz to a social media application like Vonvon, the ensuing associations and risks multiply.

By trafficking in this pleasure of a possible interior made visible, social media quizzes reveal the knots of user interaction and infrastructure construction that lies at the heart of what makes apps so difficult to pin down. Users cannot be subtracted out to discover the essence of apps, but neither can we circumscribe the platform's API to see what apps are. These quizzes simultaneously provide value to users, in the forms of self-knowledge, positive affect and pro-social connections, and materialize new data relationships for app developers and platform owners.[121] The interactions of users with apps is not a dyadic relationship, and parsing between internal/external, action/reaction, self/other, and human/machine results in a profound misrecognition of technology as tools or even media. I have elsewhere critiqued this prosthetic understanding of media technologies for the tendency to multiply a fetishistic vision of technology without accounting for the ecology of interactions inherent in newer systems of computation. (Johnson, 2019) In his tome *An Inquiry into Modes of Existence*, Bruno Latour

[121] Despite the type of quiz, and the relative subjectivity of many of the answers, users leave behind a trail of imprints in the form of site cookies, device metadata, and supplied data (e.g. images, answers, access) for each quiz. *Most Used* multiplies the indices of presence (on a platform, in an answer, etc.) in order to stick data to the bodies of users. The primary difference between the aforementioned purity test and *Most Used* is in this correlative promiscuity.

argues, “If there is an unworthy way to treat technologies, it lies in believing that they are means toward ends.” (219) Technologies, more so than other modes, tend hide their constitutive parts and relationships behind raw instrumentality, an existence encapsulated by the problematic truism 'technology is neither good or bad; what matters is how you use it.' Latour is able to circumvent this reduction of technological essence down to utility (and the accompanying requisite of *homo faber*) with the enigmatic concept of *folding* borrowed from Deleuze: “Technology always entails folds upon folds, implications, complications, explanations.” (228) That is, technologies are labyrinthine foldings of complex material histories, processes, labor, maintenance, and user desires. Apps that work flawlessly, or permit seamless transition across a platform, necessarily obfuscate the politics of that ecosystem. Because *Most Used* and *Digital Life* were so conspicuous in their dataveillance and negative public perception, they help us to locate a space of contingency amidst the everyday practices of technology. Facebook’s face only appears to defend himself and his company before Congress when the app has sufficiently outed the pernicious possibilities of the platform.

Most Used and *Digital Life* are unique, because unlike many other apps loaded upon phones, laptops, internet browsers and gaming consoles, they only existed upon the social media platform Facebook.[122] During November 2015, when *Most Used* was going viral on the site, my Facebook newsfeed was inundated by the philological topographies of Vonvon’s word clouds. The images all looked vaguely identical: a swelling of words of various sizes in the shape of a cartoon cloud with oversized words at the center representing the user’s most-used words

[122] The company Vonvon has developed a proprietary app called “VONVON Smartfren” that is still available for download from the Android store; purportedly, this app gives users access to their quiz content, although it crashes every time you open it, and is unavailable on Apple. Currently, because Facebook’s A.P.I. has limited access from apps with “minimal utility”, Vonvon can only be accessed via their website and then posted to other platforms. This discardability is key to the effectiveness of these types of data leeching, as there is zero public accountability. To whom do speak when my app is no longer supported, available or even remembered by its user? When the company folds, how do you ensure the data has been deleted?

[**Figure 22**]. In addition to size differences, the words in different user's clouds had slightly differing color palettes like that of a power point presentation, but were otherwise were the same against a black backdrop. These readily-identifiable formal aspects reinforced the popularity of the material, and supported high conversion rates. Like most corporate viral content, the sharing of the word cloud was equivalent to advertising, and this visible popularity helped it to be shared approximately 18 million times in its first week.[123] While only the resulting words seemed to set each user apart, the app provided Facebook users a unique way to play back through their personal history on the platform. John Patrick Pullen, a writer for *Time*, notes how his word cloud was completely blank, because he denied the app access to everything but his public profile (2015). Those with fewer posts and comments, or a shorter Facebook history, would have fewer words to partake in the 'quiz', skewing their results into one form or another. Each moment of user interface, then, is a unique data interaction. *Digital Life,* in contrast, displays results via bar graphs that look near identical, but signify different data markers.

[123] Similar quizzes have appeared regularly on other quiz sites such as en2.quizzstar.com, and within the Facebook app "My Most Used Words". While they are not identical to Vonvon's app, they each repeat numerous formal elements across the image constructed, and utilize Facebook's A.P.I. to garner data. Whether there are affiliations between these companies and Vonvon is unknown. "My Most Used Words" seems to be run by an anonymous individual since 2008, and Quizzstar is owned by a holding company (Share Hive S.L.).
https://www.facebook.com/pg/My-Most-Used-Words-205905459505740/about/?ref=page_internal
https://en.quizzstar.com/pages/terms

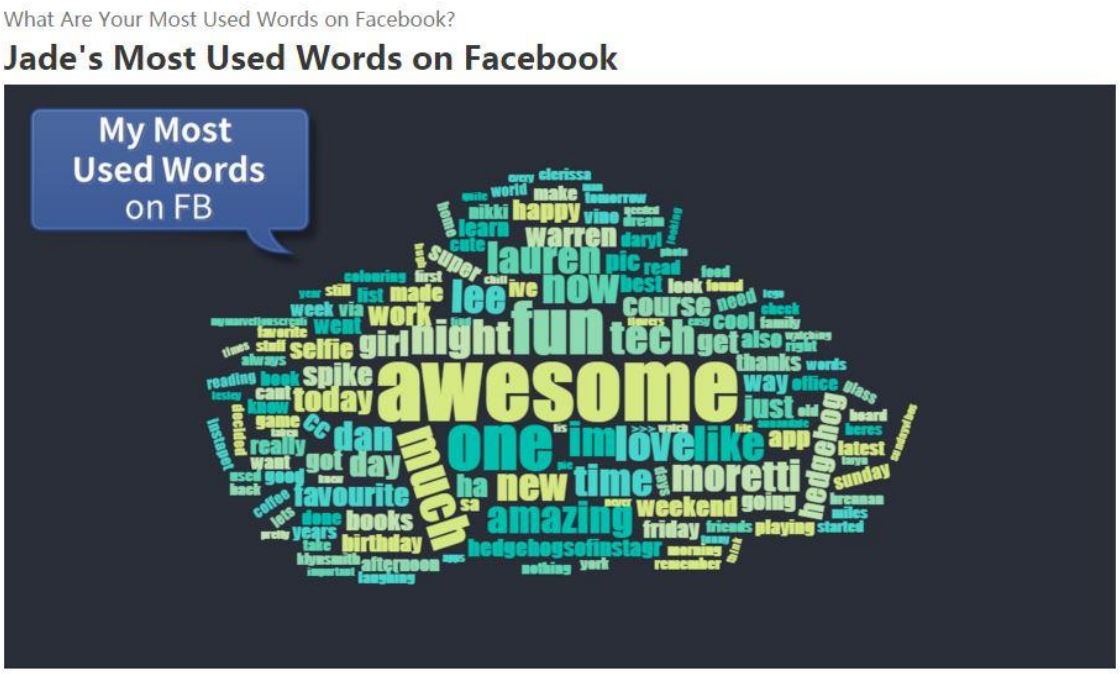

Figure 22: "What Are Your Most Used Words on FB" (Credit: Jade Brennan)

The I in APP

Apple's twelve-year old slogan, "There's An App For That"™ articulates a shift from thinking of applications as discrete software programs to a data interface or service.[124] Importantly, the act of installing an application like *Digital Life* always places a certain amount of trust in a series of hands: software developers, owners and operators, a particular edition or upgrade path (Harpold 2009), platform, website, operating system, or hardware upon which it runs. Trust is distributed across these networks of relations, requiring a certain faith or resignation from users who are provided with only minimal assurances of protection from faulty

[124] Apps, broadly, are computational systems that provide users with a specific function (e.g. messaging) or a set of tools (e.g. editing software) upon a computer system or across a digital network. They can be distinguished from firmware such as a Basic Input/Output System (BIOS) or operating systems (eg. Unix, MacOS, Linux) in that they are not concerned with, respectively, initializing hardware or running the computer. They can also be contrasted with other programs such as utilities, which are concerned with optimizing or managing aspects of the computer system itself. The lines get a bit fuzzy when speaking of virtual machines and extensible firmware, but still some differences remain. Virtual machines provide layers to run between Applications and an Operating System (e.g. Java), essentially emulating a physical computer. Extensible firmware, in contrast, provides an interface layer between Operating Systems and Firmware respectively (e.g. UEFI).

code, malicious online actors, and government or corporate surveillance.[125] Social media apps typically interface with a repository of data to provide a service (e.g. personality quiz), often obfuscating their "doings" behind an icon of interaction. When I fill out a job application, there is a process of collecting, organizing, sending, and waiting to which I am accustomed. The application of a new coat of paint to my home, or alternately, applying a unique mod to a videogame involves a period of interruption and adjustment to those material changes. Despite having object-like properties, digital applications are not just things, but importantly, processes that entangle users within a new synthetic ecology of interaction. In what follows, I offer 4 provocations on Facebook applications drawn from the examples of *Digital Life* and *Most Used* that might help to frame some wider politics of applications and the platforms they rely upon.

1. ***Apps enable a dynamic interface with particular arrangements of data***.

Simply put, applications are interactive, aestheticized gateways for data. Once granted access, apps implicitly make decisions about how data is organized and accessed, rearranging dynamically around a user's input.[126] *Digital Life*, for example, allows users to answer a set of predetermined questions by selecting from an array of discrete responses; these inputs are then analyzed via a psychological model and then represented as a series of line graphs and percentages. While some apps are primarily concerned with multiplying representational variety

[125] The reader should note: by following the similar ways in which applications engage, facilitate, and captivate user experience, I'm not arguing that cloud-based applications function identically to software running on one's laptop. The precarious trust, however, is spread across all of these systems, and is typically enforced with the same legal instrument: The End User License Agreement.

[126] It should be noted, however, that graphical decisions are always already aesthetic in any physical computing system. As Friedrich Kittler and Sara Ogger argue, the composure of computer graphics, such as choosing orthogonal over hexagonal pixilation, is already an aesthetic decision often made for financial efficiency or engineering expediency. The decision between raytracing or radiosity, for example, must choose between fidelity for rendering a single pixel (raytracing), or the three-dimensional relationships amongst pixels (radiosity); this means that computers can either render pixels accurately in their individuality, or favor specularity (reflection) in their relationship with adjacent pixels (2001: 42). Until very recently, changing betwixt raytracing and rasterization in computer graphics was only made possible by changing the material substrate in the form of a different graphics processor unit. Future outlooks for on-the-fly, or real time raytracing look promising, although they are resource-intensive, and require expensive GPUs.

(e.g. Hipstamatic), they typically make design decisions and provide options that are hard-baked into the UI. Most users take this aesthetic and informational selection for granted, as they pick apps to download precisely because they proffer particular models, resources, styles, or networks.[127] In the example of *Most Used*, a very narrow aesthetic variability was matched by a limited database variability as well. Utilizing Facebook's A.P.I. meant that the data Vonvon accessed to generate the user's lexical-image was only that which had been shared upon the Facebook ecosystem.[128] In the case of *Digital Life,* we see that the app builds upon psychological models refined in the 1980s, but draws upon a much longer history of psychometricians (since Galton's lexical hypothesis) seeking to develop a common lexicon for human personality traits.[129] The taxonomy of the Five Factor (FFM) model continues in prominence in part because it has been reinforced by two generations of psychologists (McCrae et al. 1987). Through API protocols, psychological models, and one's history of activity on the platform, the user is brought "face-to-face" with an arrangement of self that is both an image and a trail. While *Digital Life* enabled users to encounter a novel profile of themselves, the dynamic arrangement of the data's afterlife was never for users. Bar graphs of personality, and tag clouds are the lures that bring the

[127] More minute design decisions, like Facebook's automatic display of "Top Stories" over "Most Recent", can mask analytical or advertising operations under a banner of popularity. Setting one's newsfeed to display most recent stories is never a permanent decision. After a certain amount of time, the page reverts to a "Top Stories" mode. This design decision which certainly supports greater advertising revenue, cannot be permanently changed or undone. https://www.socmedsean.com/permanently-set-your-facebook-feed-to-show-most-recent-instead-of-top-stories/

[128] A daily internet search using Google Chrome, for example, is influenced by Google's advertising partners, one's saved browsing history, and AI-powered tools for catching unethical behavior, returning results personalized to the searcher and in line with Google's "values." In a 2016 article for Wired, Andy Greenberg looks at the many projects developed by Google subsidiary and their humorously-monikered "internet justice league" Jigsaw. From projects like Montage, a crowdsourced tool to evaluate YouTube videos to archive and report human rights abuses, to Conversation AI – a machine-learning filter for catching hate speech in real time – Jigsaw is Google's ethical wing, attempting to program 'goodness' into the internet. https://www.wired.com/2016/09/inside-googles-internet-justice-league-ai-powered-war-trolls/

[129] Francis Galton was a statistician, eugenicist, and early psychometrician whose "lexical hypothesis" contained two elements. The first postulate is that the values or characteristics deemed significant to a particular individual or group will eventually be codified into language, displaying the range of personality traits that are important to them. Second, the most important personality elements will be distilled into single words. So Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism – arrayed as a range or scale – would comprise the values or characteristics deemed most important to behavioral psychologist's study of personality.

user into view as political target. In this way, *Digital Life* and *Most Used* show that human interaction with data is not so much the app's goal as it is its ground. That is, the user is established as a result of the app's interface.

2. ***Apps don't just give access to invisible or unknowable worlds of data, they enact those worlds on their own (proprietary) terms***.

What exactly is a world of data, and how is it enacted? If a user wishes to access all of their Facebook data, the company provides a tool to download all of their content. The decompressed link resembles a typical computer's file folder– subfolders for html, messages, photos, and videos accompany an index, which serves as a snap shot of your Facebook history at the moment of download. This file, however, bears little to no resemblance to the platform's user interface nor to the visualization generated by *Most Used*. When a user accepts the terms of Vonvon, the app unarchives their Facebook history via the aesthetics of a tag cloud. Likewise, the clicks that accepted *Digital Life*'s terms were like the 'on' button of a vacuum, sucking up mounds of Facebook history in exchange for psychological profiles. But these images do not exist prior to the acceptance of the license agreements, nor do they indicate the sheer scope of the data accumulated in order to compute the images. There is no equivalent "thing" to be found before this particular interface, and the nebulous connections condense into being by accepting the app's processing of data. The historian of science, Hans-Jörg Rheinberger makes the argument that in the experimental laboratory, scientific apparatuses work by enhancing the "thinginess" of some phenomena while suppressing others. Rheinberger shows how the use of the centrifuge in experimental systems in the 1950's allowed early molecular biologists to not just represent empirical phenomena, but "make [them] real" through the development of models that would further research (1998, 297). For example, when scientists noticed that the centrifugation speed

and time of a rat liver's proteins components could be correlated with various “sediments” – first nuclei, then mitochondria, and finally microsomes and enzymes – a new scientific reasoning (e.g. “45,000 X g. supernatants”) could be established (294). These material changes could then be indexed to repeatable experimental phenomena and processes. Importantly, these were not procedures or numbers that preceded the experimental apparatus, but "graphemes," or discursive units of reference. When these writings are assembled together they create traces, or a sort of territory upon which further research can be deployed (287). In the construction of these new images, invisible histories are arranged into representations that are a byproduct of the mining apparatus. That is, the body of data becomes a new place upon which future speculation, research and data analytics might be performed (Arvidsson 2016).

Digital Life and *Most Used* facilitate no mere act of observation of preexisting phenomena, but the active construction of a new data assemblage within which users are both arranged and enacted.[130] The tools of the laboratory and *Digital Life* are both inscription devices that perform new realities in the act of recording. In both cases, experimental practice is a chopping block: proteins are centrifuged into oblivion in order to demarcate cellular thresholds; social media activity is pureed into components representing users’ histories. In the platform system users are always removed from data’s afterlife, and utility becomes the sole measure of technological performance. The indices of laboratory practice are not identical to the analytics run on user data by *Digital Life* (e.g. we rarely have access to these sets of operations), but note the consistencies: new apparatuses for experimentation and collection, the discreet types of data collected, and the correlation of said collection with the new metrics for scientific analysis.

[130] Applications tend to operate in concert and feedback data with larger platforms their subsidiaries and their affiliates and services. This hand-in-hand facilitation with platforms leads to monopolization, as the ability to do more through a network both increases user investment and multiplies network effects.

Digital apparatuses further confound this reification as the fusing of license-agreements to both social media applications and intimate interfaces means that our social relationships are contractually bound, serving as micro-events for data extraction. Like Rheinberger's "graphematic spaces", *Most Used* involved no mere act of observation of preexisting phenomena, but the active construction of a new data assemblage within which users are both arranged and enacted. For example, in *Digital Life,* they are utilized as mines of corporate interests and metrics for future political campaigns, all while being positioned as vectors to siphon data from their friends and further advertise the app.[131] Because users are in a very practical sense 'stitched-together' in this worlding-interface, our relationship to our data body, or our 'trace data' is in a general state of not-knowing (Wu & Taneja, 2020). Personal data is regularly shared, sold, hacked and leaked, and this typically occurs outside any user's awareness. As I type this, I received notification that ParkMobile – an app I'm required to use to park at UC Davis – was breached.[132] Where is our body of data, what does it look like, and how might it affect us as it socializes across networks? Apps must obfuscate this risk with the promise of greater self-knowledge, social value, or utility through their services, further imbricating the user as both a mine and minecart for data. Because they operate within privately-owned ecosystems managed by end user license agreements, users regularly find themselves without redress when the extent of this dataveillance is uncovered.

[131] Before Facebook changed the data access policies within its A.P.I., apps in 2014 could garner your friend's information just because you had installed the application (Constine). Prior the changes made in 2018, apps could access personal data even if you hadn't used the app in over three months (Facebook Newsroom). In addition to the numerous, undisclosed third parties that work with platforms and across applications, a huge data broker industry exists that lacks any storefront or method of redress.

[132] The hack took place sometime before the company notified users in March. I learned about the details of the hack in late April 2021 as the data went up for sale on a Russian-language crime forum. License plate data, email addresses, dates of birth, phone numbers, mailing addresses and hashed passwords were the type of information stolen in the ParkMobile breach (Krebs 2021). New worlds are being imagined and built with apps, but they are often hostile to any privacy, protection or autonomy for users.

3. ***Applications game user desire into pecuniary sociality***.[133]

Companies use apps to transform value by stimulating, observing, mobilizing, analyzing, and advertising to the social needs of their captive users. There is a game being played by app developers and platform owners encapsulated by tweaking Facebook's motto: by *"[giving] people the power to share and [making] the world more open and connected*" users become avatars. Users, on the other hand, accept the premise of social media: that by operating according to certain constraints or rules (e.g. this software, platform ecosystem, license agreement, currency, etc.) they can achieve a particular goal (e.g. greater connection, opportunity, creativity, agency, knowledge or influence). By providing a service which is contractually bound up in the economic goals of a company, an application can triangulate the needs of its community of users under a promise of increased openness. In lieu of fulfilling a social contract, applications require end user license agreements, the opacity of which is in inverse proportion to how quickly users click "accept." Pages of inscrutable legal documents form the threshold to an application's world of exchange, where discourse is intimately tied to transaction. In most cases, license agreements can be changed by the application owner without the consent of the user; continuing use constitutes acceptance of the new policies.[134] As these market-driven associations become central, it is these contractual relationships that stand over and against any rhetorical promise to connection or sociality. As Kriss Ravetto-Biagioli points out, "Our contemporary contract

[133] Surely reader, you will contest that all applications are not social. You would be right, save for the perpetual need to update, upgrade, and upload in order to participate. With almost all of our lives facilitated by media artifacts, it becomes quite difficult to disentangle social from mere technological sharing. If I post a manifesto to my blog and it isn't read by anyone, does that disqualify it as a social activity? I am arguing that these daily downloads/uploads are part of 21st century digital sociality, whether or not we can certify them as human interaction. In the book *Gaming: Essays on Algorithmic Culture*, media theorist Alexander Galloway argues that "Games render social realities into playable form." (17) Here I am stretching his argument about the social-modeling capacity of games to see how social media applications establish goals, constraints and win-conditions through legal and technological infrastructures.

[134] It would take approximately 250 hours to read all of the license agreements we accept each year (Berreby 2017).

society may stress agency and autonomy over the role of government, but this is only to conceal that such contractual relations "undercut rather than reinforce the autonomy" or liberty of its client-citizens." (118) The political social contract gives way to the application's terms of service, and all signal traffic becomes associated in order to identify the user within the larger network. Facebook's 2018 "agreement" indicates that this access can be everything from your phone's battery level and location, whom you called and for how long (Constine 2015).

The capacity to provide not immersive, but real-time, interactive feedback speaks to a certain affinity between social applications and videogames. Social apps, like videogames, permit users to perform alternate aesthetic arrangements, access curated information and offer playful responses to fickle desires and social necessities. In videogame play, value typically circulates within the game itself, or as social capital amidst a community of like-minded players.[135] By contrast, in providing an *affective interface* for the various desires for self-knowledge and self-expression, and importantly, a *social interface* for different digital networks to "converse" through an A.P.I., apps like *Digital Life* process user participation into value and ventures a posteriori for companies like Cambridge Analytica and Facebook. Sharing a word cloud like *Most Used* might provide a modicum of pleasure for the user, increased traffic to Facebook and free advertising for Vonvon, but the pecuniary rewards come later through collecting and associating the streams of data. Media theorist Alexander Galloway argues that "Games render social realities into playable form." (2006, 17) This social-modeling capacity of games that Galloway articulates, however, is flipped in social media applications: Apps play users by rendering social realities upon their digital networks into pecuniary possibility.

[135] Of course, this is a gross overgeneralization. Loot boxes, eSports, tradeable skins, gold-farming, compensation for mods, streaming, and an untold number of other content creation often results in pecuniary value for game-play. My argument here, however, is that exchange value is not typically intrinsic to the act of playing videogames. Use-value, on the other hand

Cambridge Analytica concretely established goals, constraints and win-conditions through the legal and technological infrastructures of Facebook and Kogan's *Digital Life* app, regardless of any explicit, front-facing game quality for users. Gamification this is not, as gamification increases the value for a corporation through design decisions – connecting points, rewards and markers of social value to a brand or product. This is **avatarization**: users become the customizable bodies who transport data through clicking, sharing, and building inventories of their history on the platform.

In saying that users are the avatars for applications, I am locating a distributed human body as the essential interface or means for the advancement of 21st century political economy.[136] While information networks and digital computation certainly lie at the center of economic activity, developers continue to rely upon human affects and actions as both raw material and determinant of economic activity. The recognition, collection, prediction, and even conditioning of human language, desire, and behavior is at the forefront of the business models of Alphabet (Google), Meta, Amazon, and many others. These surveillance apparatuses, part and parcel of a new organization of capital that Shoshana Zuboff calls "surveillance capitalism", positions users not as the subjects of these companies, or even their products, but as objects from which, or instruments through which, materials are extracted for the purposes of prediction: "We are the means to others' ends." (Zuboff, 2018: 94) Interfacing apps like *Digital Life* with software platforms is so valuable because they provide the mechanisms, or effective means, for the mapping of the interior world of the user, displaying a breadth of speculative, behavioral possibility into data form for advertisers. The law of large numbers finds unwieldy the prediction

[136] I'm not sure "the human" is even a helpful line to draw at this boundary, as applications work so well precisely because they are interfaces that bleed data and affect. The body and the application are not synonymous, but both require the other to fill in the image – whether of the self or of the data subject.

of single-case outcomes: one individual is really hard to predict with any certainty; multiply the sample size, even across the same user and your predictions can be used to explain entire populations.

Digital Life and *Most Used* lured users into acts of performative play, self-revelation, and sociality that exceeded the border of the body, because all who were involved were intent on understanding the possibilities at that border. In Bernard Suits' retelling of the classic fable of the ant and the grasshopper, he queries who would be proven right if, in the future, the cruel necessity of survival didn't demand work in preparation for the winter. In such a speculative technological utopia, lacking in neither time nor resources, all the "work" of carpenters, politicians and thieves is revealed to be complex games (1978, 10). Fifty years later, "unique" skills, languages, affects and even faces are up for grabs via the reverse-engineering of life's imagined systematicity. Platformed-applications – like those exploited by Vonvon or Cambridge Analytica – are so valuable because they provide the mechanisms, or effective means, for the mapping of the interior world of the user, and the breadth of behavioral possibility into data form. Suits states that, "Playing a game is the voluntary attempt to overcome unnecessary obstacles." Conversely, the application game is the multiplication of voluntary attempts, in order to mine the play to overcome the obstacle of human behavior for advertising speculation. As an interface, applications always allow two-way access; like the Janus-faced god, their gaze looks towards past and future as they partake in data and traffic in desire.

4. ***It is both the body of data generated in the use of social media, and the user's body itself, that collaborates within the inherently political organization of applications.***

Users regularly curate their lives and images in order to perform for their network, but they remain, importantly (albeit not singularly) selves. It is rare for applications to only collect a bare

minimum of data; in practice, social media equates "social" with information sharing. This means that demographic information, social relationships, facial imaging, and compounding 'data about data' form an outline, or matrix within which companies like Cambridge Analytica or Facebook can locate or generate users in precise ways (See: "Algorithmic Citizenship" in Cheney-Lippold 2018). For example, on March 28, 2019, the Department of Housing and Urban Development (HUD) charged Facebook with violating the Fair Housing Act of 1968, by allowing housing advertisers to select people by race, religion, ethnicity and zip code. While Facebook has now removed those features, they are emblematic of how actions and desires of users are capitalized upon in order to make them more effective targets, often with disastrous social consequences. This modern-day example of redlining is not incidental to Facebook, but endemic to the way it functions. By organizing users into neighborhoods based upon their data profile, they can organize them into targets for advertisers.[137] Further still, the police's use of facial recognition software like Clearview AI to target protestors in recent days – a technology trained on Facebook data – evidences the increased risk of state violence that accompanies the mere use of social media. As data is combined across numerous applications and correlated into neighborhoods of users, qualitative experiences become quantitative data points. The cycle repeats, as personal data is mined to improve analytical models and build databases which in turn

[137] Caren Kaplan, for one, emphasizes this militarization of consumer identity in the overlap of GIS (Geographic Information Systems) and GPS (Global Positioning Systems) technologies in the 1970s with the development of geodemography in the late 1960s. Kaplan attributes geodemography's success at accurately mapping populations within zip codes to the development of GPS technologies and the larger GIS developments only made possible through joint efforts of academic, military, commercial and governmental organizations (i.e. Eisenhower's "military-industrial complex"). The affinities between military targets and commercial markets extend beyond the infrastructures for their development and into their rhetorics of justification, as the *myth of precision* is propagated in both the "smart-bombs" of the first Persian Gulf War and the geodemographic data of consumer identity. "In both [the target of a weapon and the target of a marketing campaign] somebody or something has to be identified, coordinates have to be determined with available technologies, and the target has to be clearly marked or recognized in time and space" (2006, 696).

targets users online and in-person more efficiently. How do we throw ourselves upon the gears of the machine, to paraphrase Mario Savio, if we have become the gears?

The act of disentangling corporate from individual actions, or delineating digital elements from the daily rhythms of the body, fails to address the hybrid human/machine/corporate nature of sociality when it is performed across digital networks. Social media apps like *Digital Life* and *Most Used*, are a 3-plaited braids of playful self-presentation, algorithmic interactivity, and dataveillance not neatly disentangled into actions that are my choices, Facebook's platform, or the interventions of apps released by Kogan or Vonvon respectively.[138] José van Dijck argues that in the process of sharing and manipulating digital images, that the very acts of framing meaning, forming of personal memory, and establishing identity become distributed processes across digital networks and social platforms (2008). Taking *Digital Life's* seemingly-scientific personality test online generated a perception of interiority for the user that is brought into social awareness when it is shared on a platform. Importantly, platform socializing is always both publicized and privatized in the afterlife of data. The body works, plays and plays within the app, and is in turn worked and played upon. We do a disservice to the political moment if we continue to theorize the "selves" curated online as somehow distinct from the corporate platforms or social infrastructures that provide the interface to our actions.

Recursion

On July 12, 2019, the Federal Trade Commission voted to levy a five billion dollar fine against Facebook in light of its violations of user privacy discovered in the wake of the

[138] Which of the targeted advertisements did my browsing result in? Which like was motivated by an algorithm which ordered my news feed in a particular manner? When I perpetuate a fake news article, should this act of circulation be attributed to Google's profit margin, or my conscious choice? At the heart of the matter is the question as to where we might parse my actions, the platform's machinations, and the performance of the app.

Cambridge Analytica scandal. While it is the single largest fine ever given to a technology company, it will be a token punishment for the social media giant, as its monthly revenue in the first quarter of 2019 equaled roughly the same amount. [139] In fact, Facebook's stock gained 1.8% in the 30 minutes before the stock market closed that day, following the report of the FTC's fine.[140] Apps like *Digital Life* and *Most Used* were subsequently banned from the site, but not before they vacuumed up immeasurable volumes of data, that are beyond the reach or comprehension of their original users [**Figure 23**]. *"*Give people the power to share and make the world more open and connected*"* was more than Facebook's slogan from 2009-2017; its rhetoric marked the imagined potential of social media technologies writ large.*[141]* Merely by utilizing their application and sharing more of themselves, the arguably progressive social values of openness and interconnectivity would be achieved. Google's slogans "Don't Be Evil" and "Do the Right Thing" have the advantage over Facebook, in that the specificity of their operations are nowhere in view. Instagram, on the other hand, vows to, "Capture and Share the World's Moments." The benefit of our contemporary moment, is that we have lived to see the speculative future of these slogans. Platforms have become the arbiters of success and production, and the world is anything but open and connected following the proliferating dataveillance. But the lures

[139] https://investor.fb.com/investor-news/press-release-details/2019/Facebook-Reports-First-Quarter-2019-Results/default.aspx

[140] On July 24, 2019, the same date as Robert Mueller testified on Capitol Hill in regards to his report on the Russian government's attempt to influence the 2016 election, both Facebook and the FTC separately confirmed this 5-billion-dollar penalty, and announced new privacy oversight that could lead to legal penalties for officers, including Marc Zuckerberg, if they are violated. After years of investigation, and untold damage already done by Facebook, the fine seems a too little, too late token punishment to account for the afterlives of data that have been utilized for the advertising products and data ventures of the future.
https://www.facebook.com/zuck/posts/10108276550917411?sfnsw=cl
https://www.ftc.gov/news-events/press-releases/2019/07/ftc-imposes-5-billion-penalty-sweeping-new-privacy-restrictions

[141] In private, specifically amongst engineers, Facebook's slogan was "Move fast and break things." Together, the two sayings prove succinct in their explanatory power for what happened in the first decade of surveillance capitalism: as users were inspired to be open and share, tech companies could moved fast across the world, privatizing public space and turning what (Citation) called "general intellect" into proprietary data.

of openness and connection, of technological enablement and salvation, regularly entice users to perform data for self-knowledge and social value, perpetuating continued reliance upon these systems. In fact, these platform monopolies are consistently treated as the only solution to the problems which they are responsible for generating, as could be seen on Capitol Hill during Zuckerberg's testimony.

> 10. Apps with minimal utility that provide predictions, assessments, or similar outputs to the user, may not be allowed on Platform. For example, apps that provide (or claim to provide) users with assessments of personality, personal attributes, character traits, behavioral tendencies, or whose core functionality otherwise involves making predictions about who the user is, may not be allowed.

Figure 23: Update to Facebook's Platform Policies (Credit: Facebook)[142]

Apps like *Digital Life* that operate through open APIs, perform in the shadows while projecting collective, customizable hallucinations; they make visible the acts of communication (i.e. "the reveal") but obfuscate the socialization of data that generates value for the platform, turning users into drones. Amplifying signal traffic is important to platforms, because facilitating more interaction equals a larger body of data from which they might extract pellets of value. To a platform, sociality is pecuniary – even the most banal of social engagement increases its capacity to generate revenue.[143] As users contribute, circulate and save content, they populate platforms with truly, mind-boggling amounts of data to be mined. According to DOMO, a cloud-based

[142] https://developers.facebook.com/policy

[143] An analogy could be made with the popularity of U.S. shopping malls of the 1980s and 90s. As spaces where signs and commodities could circulate, the mall is what Margaret Morse calls a site of "distraction," that is, a "locus of an attenuated *fiction effect*...a partial loss of touch with the here and now." (193, emphasis in original) This place for cultural and economic exchange and signification is "a *nonspace* of both experience and representation, an *elsewhere* [and elsewhen] which inhabits the everyday" (195, emphasis in original). The nonspace of malls, says Morse, is like the freeway and television in that individuals are displaced and disengaged from wider worlds and realities. In their cultivation of states of distraction, nonspaces work to conflate a public sphere – now stripped of subjectivity and substance – with consumer identity and "the pure exchange value of language and images." (212) As they are layered into the practices of watching, driving and shopping, these markets of potential are enacted in the body which tranverses them, playing out fictions that can be resolved by the perpetual consumption of images, the traversing of space, and the purchase of commodities.

platform for businesses, estimates were that 2020 would see 1.7MB of data created *every second for every human on earth* (2019).[144] If none of your neighbors utilized Nextdoor, then time spent complaining on that application will be equivalent to screaming into the void. But, if your work colleagues regularly use a private Facebook group to share news articles or photos, comment on unfair labor conditions or organize, that seems to speak to the necessity for the role of platforms in employment, entertainment, and personal communication. This is important, because as connections are facilitated by digital platforms, and pecuniary sociality is multiplied by social media apps, we encounter occasions where this virtual space begins to become real. As user awareness was raised regarding the danger of apps like *Digital Life* following Facebook's Congressional hearings and public apologies, it's important to realize that the very same precarious logic of "openness as exposure" is at work across online spaces. As we login with Facebook, utilize Google search, and move through websites with tracking cookies, we are the repeat users, or avatars of new economic and political asymmetries. Is there an alternate to this foreclosed open world? Can we repeat differently?

[144] By comparison, my family's first computer in 1986 – a Tandy 1000 – had an "upgraded" hard drive with a 20 MB capacity. It would only be able to hold 11 seconds of my data generation today.

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Smart Meters, Energy Monitoring and Grids

Space is a social morphology: it is to lived experience what form itself is to the living organism, and just as intimately bound up with function and structure. - Henri Lefebvre

Almost everything in the Lucerne Valley is sunbaked and covered in dust: the tawny jutting rocks of the Ord Mountains, the dun sand and dirt roads unmaintained by the government and mile after mile of sunburnt saltbush sprinkled about the bone-dry Mojave desert. I am driving down Highway 247 which cuts through the landscape like a meridian, at the end of a self-selected tour of generating stations in California's energy infrastructure. Since the 1980's, sites in the Mojave have been chosen for experiments and investments in the burgeoning solar industry, due to the arid climate and hours of exposure to direct sunlight. I began today in Daggett, leaving the site of the Solar I and II Projects [**Figure 24**], which following its dismantling on November 25, 2009, has been completely swallowed up into the desert [**Figure 25**]. Fifty miles away, my phone chimes with notifications as I enter the invisible bubble of cell reception in the Lucerne Valley. Pulling over to double check my directions, I skim an email from Google's NEST, a smart thermostat that informs me that a detailed breakdown of my monthly energy use – the "June Home Report" – is ready for perusal. As I had moved out of this particular house a year prior, I found myself in a strange position to surveil the electrical consumption of an occupant who hadn't bothered to reset the meter. As I continued my search for a new 430-Acre PV (photovoltaic) system called the Ord Mountain Solar Project, I discovered the site was in a sort of legal limbo, and construction had not yet begun. Positioned here at the edge of the desert and monitoring a home 453 miles away through a cellphone is where this chapter begins. These spaces and technologies are both drawn together by, and actively constructed by California's heterogeneous Smart Grid. Amidst this confluence of

generation, speculation, smartness and metering we see an oft-disappearing infrastructure reaching towards the interchangeability of a market at every point.

Figure 24: Solar II in Daggett. (Credit: Sandia National Laboratories, 2001)

Figure 25: Site in Daggett. (Credit: Author 2020)

Grid Fantasies

We want grids to operate according to a modular logic of interchangeability at all scales, an arrangement that forces land, home and pulses of energy circulation to function like Excel. Like the platform and the application, the grid is designed to flatten difference, but this time across physical geographies. Because of this, the grid has a shape: marked by striations and outposts, millions of miles of cable crisscross over and under in physical markers of presence. Of all the synthetic ecologies, its physical components are the most readily available to human sensibility. But here's the strange thing: it represents in a curiously-inverse way to something like a platform. Platforms like *Minecraft* are dominated by visual representations, while the data generated, collected and processed typically remains hidden from view. Energy grids are quite physical, often taking "the shape of the network" (Hu 2015), and yet they come into our awareness in numbers, charts, and graphs that show development and costs over time [**Figure 26**]. The grid's momentum is always future looking, as it disappears its antecedents, sometimes quite literally [Image 2] behind modulations to its locations and capacities. This is because the

grid is part fantasy. It is always trying to be more resilient, more interconnected and more capable of ushering in future desires through smartness and modularity.

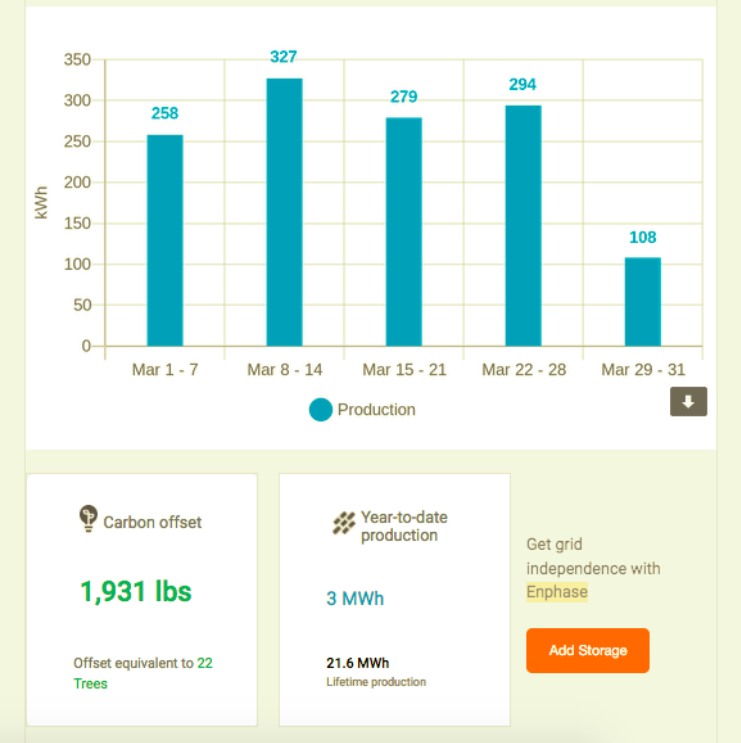

Figure 26: Author's March 2022 Electrical Generation (Credit: Author)

The fantasies of unlimited clean energy infrastructure are often brought down to earth in the rather banal arrangement of generation, transmission and distribution architectures that we regularly ignore across our geographic landscape. Speculation about future energy generation and limitless capacities discount the heat released and land terraformed in order to make everything the same. Grids are not just an architecture, but a diagram. They are a logic for making energy into a fungible unit, and dislocating the spaces of generation and pollution from the transmission and distribution networks. From the user side - I can access my energy stats, and like an environmentally-conscious citizen, alter my behavior to make improvements.

There is more than a little pleasure in the data visualizations provided by the many apps available to parse out and measure the energy components of our lives. The analytics we are subjected to when purchasing the Nest or upgrading to a SmartMeter in our homes provide some truly unbelievable information. Hourly charts of kilowatt-hour (kwh) usage, estimations of the cost for today or a further delimited period of time, and bar graphs and pie-charts that correlate your bills to the weather, compare with the average consumer, or delimit problem areas are just a few of the possibilities from PG&E's SmartMeter-connected efficiency visualizations. Nest goes a step further by allowing you automation from the Nest app on your phone. That means you can prep your house for your arrival with climate preferences on the application, in addition to charting usage to particular rooms, appliances, or times. The convenience of checking a smoke detector battery by pinging it from the Nest app is certainly a step above dad's method of touching the 9-volt to your tongue and feeling the presence or absence of the circuit-closing jolt. All of these moments of interaction give the user a sensation of energy independence, of sustainability and efficiency as an individual metric.

This chapter seeks to enlarge our model of energy infrastructure to include more than just the material pieces in the generation, transmission and distribution puzzle. One difficulty in writing about the artifacts of infrastructure is that they have faded into the backdrop of social space; their borders are both nondescript and concretely material. What do I mean by this? It is tempting to view infrastructure, especially those deemed essential for transport, power and communication as settled; yet the energy sector is dynamic and the technologies foundational to its operation continue to promulgate relationships to the structure which are largely passive. Lisa Parks and Nicole Starosielski argue that bringing an "infrastructural disposition" to media studies will help to shift focus from invention to the processes of distribution, the components and

protocols that participate in these processes and the requisite technological illiteracies which limit citizen participation in infrastructural deployments (2015). My aim is similar, as I mean to complicate this settled relationship to the apparatuses of the state power grid, viewing these architectures as neither inevitable nor necessary, but negotiated. Following John Law's understanding of *heterogeneous engineering,* I see the relative stability in the functioning of technological devices is prefaced on the use and shape of the larger infrastructures in which they participate (1987, 113).[145] Alternately, energy grids advance through decades of technological updates and policy changes which reposition individual nodes and edges in relation to the whole.

Infrastructures of power are planned, but they are not deterministic, as regulatory policy and technological interface result in vastly different grids depending on location, time of day and even climate.[146] Generating infrastructures involve more than my local defunct reactor at Rancho Seco Nuclear Facility. They include the industry partnerships, land-lease agreements, technician training regimens, hazardous waste disposal, and public debt to finance systems that never reach capacity. Transmission elements are not just the lines which stretch thousands of miles through the state or the substations for decreasing voltage; they are the protocols which determine the height of lines, the aluminum to steel ratios of the cables, the voltage which runs along the line, the energy policies which allow out-of-state interconnections and independent system operators

[145] Law, following Callon, states that the "stability and form of artifacts should be seen as a function of the interaction of heterogeneous elements as these are shaped and assimilated into a network."

[146] For example, ERCOT (The Electric Reliability Council of Texas) manages the grid in Texas, where a generation of libertarian policies and laissez faire generation relationships has resulted in an electric grid that is basically a platform. Anyone with a big enough generator and ample fuel reserves can sell excess power to the grid at any time. By contrast, CAISO (California Independent System Operator) which oversees most of the energy distribution, transmission lines and restructured energy market takes a much heavier hand in the management of energy in California. This can be seen in the rolling blackouts in the summer of 2020 when, regardless of necessity, power was shut off to hundreds of thousands of homes amidst fires and heat waves. ERCOT, however, has been proven less resilient against the cold, as could be seen in the tragic failures associated with the storms of February 2021. As Ted Cruz flew off on vacation, his constituents froze to death due to failures at multiple points in the grid. After the fact, renewable energy generation was blamed by Cruz and others, despite evidence that most of the failures came from the freezing of natural gas lines and problems with transmission (Pike 2021).

(ISOs) to manage the load. Distribution infrastructures encompass vastly more than the trashcan-shaped transformer on the telephone pole in your residential neighborhood, as electricians who maintain the lines, solar panels on your roof and smart meters at the threshold to your home complicate your position on the grid. Most of these physical elements of generation, transmission and distribution operate entirely outside of any interface layer for electricity users, who, content with the lights staying on, only notice the infrastructure when either monthly bills (or catastrophe) arrives.[147]

Electricity occupies an almost magical space in the history of technology in general, and in media theory more particularly. Since at least McLuhan's statement that "the electrical light is pure information," scholars in the field have grappled with the implications of a supposed medium without content (1995, 151).[148] Despite McLuhan's hyperbole, and his lack of technical knowledge, his 'environmental' focus is helpful for attending to the scale and meter wrought to human society by the new technology. Friedrich Kittler too, sees something unique – albeit horrific – in the collapse of distinguishable individual media channels into the electrical signals

[147] Most people in Yolo County, for example are quite unfamiliar with the operations of their energy infrastructure, despite numerous changes in the last decade. In 2014, California state legislature amended Govt Code § 6502, allowing 2 or more public agencies to enter into joint partnerships in order to purchase energy directly from providers.[147] Since 2002 in California, Community Choice Aggregation/Energy programs enabled by Assembly Bill 117 have allowed cities and counties to enter into these purchase agreements, despite years of opposition from utility providers. In addition, this power doesn't have to be acquired from its geographic location, nor do the partners have to be proximate. In 2016, for example, my local Yolo County partnered with the City of Davis to secure energy from more sustainable sources, and at a lower cost. This means that PG&E will still provide the transmission lines, and in fact, the bills will still arrive at private residences from the utility provider, but the sources will be greener and the cost over a decade is estimated to be lower. That said, the city of Davis and Yolo County had to take out a 3.5 million loan in order to pay for the costs of this joint powers agreements, which includes paying PG&E high "delivery and exit fees" (Ortiz 2016). As the larger partnership incorporated Woodland, the joint powers agreement has utilized Valley Clean Energy in 2018 to source cleaner energy at a more competitive price (Anderson 2018). These kinds of partnership, alongside the pushing of renewables like solar and wind, and the allowance of net metering – where excess generated power can be sold back to the grid – has made California into one of the leading edges of energy grid development. For example: Yolo County's government buildings, all outfitted with solar panels, generate approximately 50% more power than it uses, selling the power back to the grid (Miller 2016).

[148] McLuhan explicitly sees electricity as decentralized, and his emphasis on the psychic and social effects, while important for evidencing both the municipal and rhythmic changes to human sociality, completely ignores the very material history of centralization and monopolization of electrical power which persisted until the last moments of 20th century (116).

in optical networks: “Sound and image, voice and text are reduced to surface effects, know to consumers as interface. Sense and the senses turn to eyewash” he proclaims at the outset of his text (1999, 1). Kittler’s interest in differentiating storage media notwithstanding, this optical/electrical convergence is an almost epochal (or with Foucault epistemic) shift across his oeuvre.[149] But it is Langdon Winner who, in picking up an optimistic, albeit modestly-deterministic thread, advances an argument about the political contours of solar technology. In his oft-cited “Do Artifacts Have Politics?”, Winner distinguishes between technologies that settle issues in a particular community and technologies that are inherently political (1980). While his argument about the ordering potential of technologies has been critiqued (Woolgar 1991) (Bernward 1999), his argument on the fit of certain architectures to particular political systems is of interest here. Winner argues that certain technologies may be so compatible with certain systems of governance that they may all but require them: “As long as [the atomic bomb] exists at all, its lethal properties demand that it be controlled by a centralized, rigidly hierarchical chain of command,” argues Winner (1980, 131).[150] Winner follows with the speculation that perhaps solar technologies are more compatible with distributed or egalitarian systems of government. Is it possible that certain more decentralized technologies for energy systems might embody more democratic political arrangements?

[149] “Media “define what really is”; they are always already beyond aesthetics.”(1999, 3) Kittler’s media materialism has been critiqued for a variety of reasons, not least of which is his ability to theorize difference insofar as individual encounters with technologies are not identical in their effects. That said, Kittler’s specificity with regards to material, and oft-incremental changes in technology is helpful when attending to electrical systems. Insofar as there is a level of saturation in the electrical grid wherein it is hard to distinguish between it and us, his method of following technical changes (and in my case, the policy implementations) becomes a place to question the supposed free-flow of electrons to see the technological monitoring and financial speculation at work.

[150] Peter Galison has advanced a similar argument, in that nuclear technology required a level of security and secrecy hitherto unseen. Following the Atomic Energy Act of 1946, sharing any data about fissionable material, atomic weapons or power could be punishable by death or life imprisonment (2010, 950-2).

These speculations about technical arrangements and energy futures often resort to a part/whole arrangement that mirrors some of the logic of the grid, repeating old tropes about the individual and his or her relation to the collective. Consider the movie *Iron Man*, wherein the genius inventor and arms salesmen Tony Stark (Robert Downey Jr.) is portrayed as the quintessential American entrepreneur. After a weapon's test for the American military, his military entourage is attacked, and he is imprisoned in caves in Afghanistan by an unspecified Islamic faction. The camera pans slowly across a metallic cylinder – bearing the name "Stark" as the soft focus isolates out hands, dismantling the very missiles upon which he had built his fortune. With his engineering prowess, rare-earth metals (".15 grams of palladium"), Stark deconstructs the weapon, hammering and soldering components into an "arc reactor," a magical energy source that can power his suit, his factories, and a clean future. It is fitting that the entire foundation of the Marvel cinematic universe (and its 12+ billion in profits) was built out from this movie, and this inventor who literally internalizes a power station in order to wrap himself in technology with which he can protect the earth from the very violence that his military-industrial contracts have caused. The histories of American power consumption are well-documented and fraught with international oil embargos, resource wars, massive global extraction apparatuses and asymmetrical consumption and benefits. But the fantasy lingers: of the singular, isolated energy user, who, with enough power can master their destiny. The fantasy shifts – to distributed solar networks and off-the-grid living, but it is a fantasy built out of grid logic. The grid works on these individual units, uniting them together into a ledger that it then attempts to balance. Future speculations and lingering mistakes exist side by side on the grid, and they can only be seen by zooming in and out of the border of the home.

This chapter shifts scales regularly, a methodology that is meant to call attention to both the artificiality of the scope of critical inquiry, and the difficulty of examining smart meters, grid policy and energy generation in isolation (Fuentes 2013). Energy, like (or as?) big data, has increasingly come to be seen as a free flow of electrons into and out of spaces, in turn reinforcing a laissez faire neoliberalism that reduces everything to the standard of price per kilowatt hours ($/kWh). As such, surveillance in the form of metering becomes seen as a social good to be able to manage electrical supply through various means including efficiency benchmarks, distributed generation, net metering, demand response and non-wires alternatives.[151] But where precisely do we mark off the borders between public and personal space when energy infrastructure extends across individual devices, private homes, state borders and public lands? In her work, Marcela Fuentes sees how art activism – as tactical media (see Rita Raley 2009), is deployed in transnational contexts, calling attention to and reclaiming "contested spaces defined by ideologies of exclusion and marginalization" (2013, 52).[152] Zooming in and out is a practice which Fuentes garners from the artivist collective *Iconoclasistas,* a tactic that allows the mobilization of "geographic scale as analytic methodology," collectively filling-in stories of lands 're-placed' by factories and businesses, and reframed by authorized maps and borders (48). As I am interested in official, or state, developments of power, my use of her method is flipped

[151] "Non-wires alternatives" is a catch-all word for investments and operations that don't include adding/upgrading new transmission and distribution projects or increasing generation through building new generators. These practices might include some measure of energy storage, efficiency standards, better software/control systems, and distributed generation (Chew et al. 2018, 11).

[152] Raley, in turn, is building upon Michel de Certeau's conception of space in *The Practice of Everyday Life*, wherein he views strategies and tactics as competing practices viewed from a position of power and property. For those subjects who can and do exert their will upon an environment (property developers, scientific institution, city planners), a *strategy,* "assumes a place can be circumscribed as proper (propre), and thus serves as the basis for generating relations with an exterior distinct from it (competitors, adversaries, "clienteles," "targets," or "objects" of research" (2002, xix). A *tactic*, in contrast, "insinuates itself into the other's place, fragmentarily, without taking it over in its entirety, without being able to keep it at a distance" (Ibid.). Those who delineate proper spaces (often around property lines) and have the power to enforce those lines and exclusions work in the domain of the strategic, while those without a home base or proper space must always work tactically – at moments of opportunity, and in transit (37).

here. I move from public works to individual devices and back into energy policy in order to show how the new totalities we call Smart Grids are precariously constructed, reframing the home within a neoliberal framework, and eliding a century of privacy law. Shifting scales in the analysis of energy infrastructure helps to locate the relationship of power as kWh vis-à-vis power as a form of authority and control.

Outside In

From its founding amidst silver and Borax mining in the latter 19th century, to its present state of decay, the town of Daggett, CA serves as a visual metaphor for both the Western frontier, and the frontier of energy policy in the state (Van Dyke 1997). The first time I drove in to Daggett, I surmised I was entering a ghost town as everywhere I looked I could see boarded-up houses, rusted metal and dust-covered roads. Located 10 miles east of Barstow in the Mojave desert, Daggett is home to little more than a liquor store and a regional airport that lies far outside the graveyard of this abandoned settlement. The one structure which stands above the rest is Coolwater Generating Station, a 727 MW gas-fired power plant that has been shut down since 2015 as it can no longer meet the regulatory standards in California (Cassell, 2015). Directly next to Coolwater [**Figure 27**] is the plot of barren land where the Solar I and II Projects stood, and it is bookended by the Sunray 2 and 3 photovoltaic systems to the East [**Figure 28**].[153] Daggett's spatial arrangement is privy to this modular tendency in the California energy grid. In

[153] The owner of the liquor store informed me that it was 2009 when the Solar II was demolished, but there have been other solar systems even prior in the surrounding area. A little bit of research revealed that the Solar I and II Projects provided research into concentrated solar people, proving the feasibility of the massive Solar Energy Generating Systems (SEGS) network in the Mojave, with the first two located in Daggett. As the price of photovoltaics came down, and the maintenance cost of SEGS went up (an explosion in 1999 was particularly costly), the Sunray systems became the next wave of solar in Dagget. Managed by Cogentrix Energy, LLC and owned by the Carlyle Equity Group, it is emblematic of a shift away from publicly-owned utilities to projects that use public funds and are managed by limited-liability corporations. A brief survey of only the 2019 solar projects in California from the California Energy Commission, reveals hundreds of these partnership arrangements across the state.

grid logic, once the transmission lines are made analogous to a network, the generating and distributing components can be swapped out in a sort of technological sleight of hand. That means that generating facilities that are more efficient, or require less maintenance, can replace even relatively-new existent stations so long as the lines can handle the voltage. Because large scale energy investments are typically financed through taxes, bonds and loan guarantees, communities are consistently placed in the position of absorbing risk, while plug and play ventures regularly avoid liability. A particularly expensive version of this can be seen in Tonopah, NV where public funding in the form of loan guarantees of over 700 million dollars are owed on the Crescent Dunes facility that was defunct the moment it was operational (Martin & Querolo).[154] The history in Daggett, while infused with a similarly-speculative green futurity, mirrors the town's present state of abandonment. In the quest for efficiency and a lower $/kWh, only a skeleton crew is required to maintain photovoltaic fields.

Figure 27: Coolwater Generating Station (Photo: Author, 2020)

Figure 28: Sunray Energy Project 2 and 3 replaced SEG I & II (Photo: Clēnera. 2017)

Solar I and II were the first large scale concentrated solar power (CSP) projects in the U.S. Undertaken by the U.S. Department of Energy, and a group of laboratories and utilities, the

[154] The Crescent Dunes Solar Project was a massive CSP generating station that was financed in large part by loan guarantees. For four years after it was turned on, the cost of Megawatt Hours was consistently at about $135.00 per MWh. Photovoltaics, on the other hand, dropped from $147.00 per MWh in 2014 to $51.00 in 2019. When customers seek other cheaper or more reliable sources to fill their energy needs in this market, billion dollar plants can go under overnight.

10 MW project was meant to demonstrate the feasibility of large utility-scale power generation using a central receiving CSP system.[155] Unlike photovoltaics which convert light to electricity, CSP utilizes heliostats (lenses or mirrors that stay perpendicular to direct sunlight) to direct beams of light for thermal energy generation in either a dish, trough, or receiving tower.[156]An analogy would be using a magnifying glass in the midday sun to light something on fire. By pinpointing the sun's thermal energy upon a collection point, steam turbines can be powered "[producing] virtually no emissions" (NREL). Solar I successfully operated between 1982-1988, but due to heat loss in the receiver and storage issues for low-sunlight hours, was further iterated upon through Solar II. Solar II, which ran from 1996-1999, utilized a molten nitrate-salt for steam turbine generation that was capable of thermal storage [**Figure 29**]. While the system would have required fossil fuels to keep it running at night, it was the first system of its type that showed CSP as a viable alternative for large scale solar generation.[157] After the system was shut down in 1998, the facility was converted by researchers from the University of California, Davis into an Air Cherenkov Telescope due to the individually manipulable heliostats [**Figure 30**] that were controllable by a central computer. The conversion project started in 2001 – named C.A.C.T.U.S. (Converted Atmospheric Cherenkov Telescope Using Solar-2) – operated from 2004-2005 and was the only facility at the time capable of detecting massive gamma-ray bursts (Whitehouse). At the close of their evaluative report of Solar II, before the CACTUS conversion,

[155] The DOE, Sandia Labs (Lockheed Martin), National Renewable Energy Laboratory (NREL), Southern California Edison, LA Dept. of Water and Power, and California Energy Commission.
[156] Heliostats were first invented by Willem Gravesande, although in principal they had been described over 60 years prior by mathematician and physiologist Giovanni Borelli (Middleton 1973). Used for a variety of optical experiments in the 18th century, or for daylighting during experiments, they aren't utilized in solar energy projects until the late 70s and early 80s.
[157] In fact, 2 years after Solar I began producing, Daggett became home to 2 parabolic trough CSP systems called SEG-1&2, operated by Brightsource Energy, Inc. When those were dismantled in 2015, due to a mineral oil tank explosion, the Sunray photovoltaics were there to take over the load generation for a fraction of the maintenance cost.

Sandia scientists concluded that while successful, the project's shortfalls stemmed from utilizing older technology to do future work: "it is clear that retrofitting 1970s vintage hardware to reduce project costs led to even more problems than a typical first prototype plant would experience." (Reilly & Kolb, 2001) This tendency – to start new energy projects with new tech, and to forego maintenance and iteration – can be seen in most solar projects following this moment. While The Solar Project is certainly not responsible for this plug and play logic, it partakes in it via the dynamically-evolving energy policies of the past 50 years. As a result, implications for individual consumption, not to mention a century of privacy law, are largely neglected amidst the fantasy of an energy infrastructure made to behave like a market.

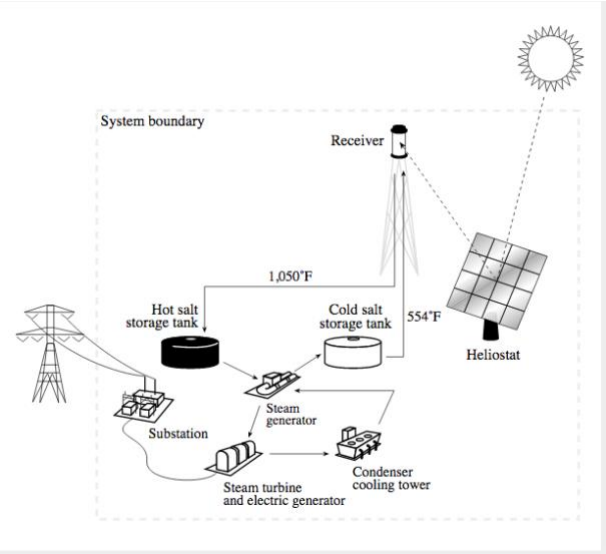

Figure 29: Solar 2 System Diagram (Photo: NREL 2001)

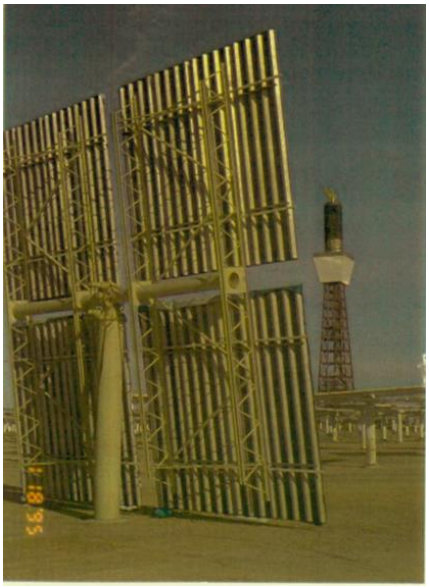

Figure 30: Heliostat measuring 42 m² (Photo: Reilly & Kolb, 2001)

Down the Line

In little over a generation, U.S. policy shifted energy infrastructure (i.e. generation, transmission and distribution) from a few 'natural' monopolies to a newly-defined "smart grid." In this modernized system, any speculative future demand could be met with investments in technologies for metering, storage, communication and control. In 1978, the Public Utility Regulatory Policies Act (PURPA) was passed to encourage energy conservation and domestic

energy investment and increase supply from renewables. At this time, utilities were vertically-integrated and protected "natural monopolies," because it was thought that only they could take advantage of economies of scale to generate more power for cheaper due to the high financial barriers for the building and operation of generation and transmission facilities. In the wake of OPEC's 1973 embargo, President Carter's energy plan sought to balance supply and demand by focusing on conservation on the one hand, and finding alternate supplies of energy through renewables and cogeneration on the other. Cogeneration, importantly, allowed local utilities to buy excess power from "qualifying facilities," or 3rd party industries who had produced power in excess of the needs generated for their factories. Qualifying facilities sold power back to the grid, and utility companies were required to buy it if the price was competitive (which, incidentally, they always were because it was in excess of their in-house needs).

This history of cogeneration had the side effect of laying the first steps towards a restructured energy market (DITS 1997).[158] When President H.W. Bush signed the Energy Policy Act in 1992, the deregulation mania that swept across other industries in the 1980s became the norm in the energy sector. While previous energy policies (PURPA and PUHCA) were amended to increase energy efficiency standards, the act promoted a laissez-faire approach to energy acquisition. On the one hand federal lands were opened for increased oil and natural gas production, while on the other utility-owned transmission lines would be made available for

[158] President Carter saw the need for balance between bringing down demand through conservation and increasing supply through alternative fuel sources and research. Largely unexplored in this article is the role of global supply chains – specifically for fossil fuels – and the smart bombs and dumb wars that advance a logic of freedom that is really about market access to greater supply. My focus on PURPA, and for that matter the 1992 and 2005 Energy Policy Acts cannot be considered independent from war. "Liberating" Iraq is not separate from, but endemic to, the liberation of energy markets. The death of the other which secures our grid's access, is rarely part of the calculus of cost. It remains essential to the extractive logic, however, demanding a flow that is uninhibited and agnostic to its generating stations. In short, conservation that doesn't account for long-term environmental and geopolitical exploitation is mere conservatism.

energy arbitrage. In effect, the transmission lines became a network along which power producers could sell locally-generated power outside of their local boundaries.[159]

The final nail in the coffin of energy regulation came with the Energy Policy Act of 2005, which in addition to repealing PUHCA (the Public Utilities Holding Company Act of 1935) which had regulated energy companies as part of larger New Deal trust-busting legislation, first advanced smart meters into legislation.[160] In particular, section 1252 gives companies 18 months to provide a "time based rate schedule [which] shall enable the electric consumer to manage energy use and cost through advance metering and communications technology." (2005) "Demand response" became the catch phrase for a new model of power distribution that placed the management of energy resources into the hands of consumers through monitoring gateways and time-based pricing.[161] When the Energy Independence and Security Act of 2007 (EISA) was

[159] The Southwest Blackout of 2011 and the Enron scandal in 2000 were two sides of the deregulatory coin when viewed from what happened to energy beginning in 1994, following the passing of the 1992 Act. In the case of the Blackout, the Southwest Power Link – which allowed interconnected grids to transmit power across Arizona, San Diego and Mexico – meant that all energy was pulled from a single location (San Onofre Nuclear Generating Station) when the rest of the generating stations were tripped off. In the case of the Enron scandal, utility companies and customers could be gouged on prices when certain generating stations were shut down for maintenance to drive up the costs for energy trading. Section 3 of PURPA was amended so that integrated resource planning involved balancing conservation and alternative fuel needs with 'risk factors' to consumers: "The process shall take into account necessary features for system operation, such as diversity, reliability, dispatchability, and other factors of risk; shall take into account the ability to verify energy savings achieved through energy conservation and efficiency and the projected durability of such savings measured over time; and shall treat demand and supply resources on a consistent and integrated basis" (1992, 3769). Resource choices for an imagined free-flowing energy market were meant to balance environmental impact, conservation, or renewable fuel investment.

[160] Of the five pieces of legislation considered in this article, the act of 2005 is the first one where the interconnecting generation, transmission and distribution arms of electricity are referred to as a "grid." It is not yet "smart," but this now-interconnected network of transmission lines can serve as a conduit for energy supply and demand, regardless of fuel types, the location of generation stations, and local distribution sites. While the 2005 Act gave tax breaks to renewable energy and conservation efforts, it also further subsidized nuclear power, fossil fuel generation, and coal pollution mitigation programs (e.g. "clean-coal" research). Further deregulation can be seen in the form of removing EPA protections on water for the expanding fracking operations across the country.

[161] Demand response encapsulates numerous elements, and is the end game of something like Carter's plan: match supply to demand more accurately by lowering demand. Peak hour prices (i.e. time-based pricing), metering feedback to adjust use to cost, subsidizing the cost of new appliances with certain efficiency ratings, and even rebate programs to shed load use with rolling blackouts. It takes a grid, properly conceptualized, to do this. Prior to, and overlapping the history of demand response is something like the Toyota model of energy generation. This just-in-time approach to peak hours meant a lot of generating plants (e.g. Coolwater Generating Station in Dagget) would be flipped on and off daily to meet demand.

signed into law by President George W. Bush on December 19, the technologies, protocols and material connections for power had already been remade by 3 decades of energy policy. The transition from PURPA to EISA was a move from conservation to market freedom, and it could be summed up as 'efficiency through control.'

The goals of EISA were many, but in broad strokes the law attempted to further the decades-long progression to energy independence, develop renewable fuel resources, and increase security and control for households, industries and the federal government. For our purposes, EISA was the first federal piece of legislation that put into definitive language the development of a "Smart Grid," a term that had been circulating since at least 2003.[162] The official language of the US Smart Grid was codified in section XIII [**Figure 31**], and contained 10 elements to modernize the federal electrical grid. The Department of Energy does imagine a smart grid earlier [**Figure 32**], but it isn't translated into policy until EISA.

[162] The Department of Energy has used the "smart" language since releasing the July 2003 report entitled "Grid 2030: A National Vision for Electricity's Second 100 Years." While it didn't yet define what the smart grid was composed of, the DOE's 2010, 2020, and 2030 benchmarks began to elaborate some of the components that would be necessary to arrive at ""smart" power systems" for energy distribution and generation (v). In the report, the DOE recommends developing technologies such as ""smart" thermostats" to meet peak demand (7), and implementing a "smart, automatic network" that can assess transmission in real time (13). The report imagines ""smart" appliances" driving new telecommunications architectures (14) and deploying the "next generation "smart meter"" by 2010 to interface between the home and utility companies (23), expecting all appliances to have "smart capabilities" by 2020, and reach the goal of "100% of power [flow] through smart grid" by 2030(26). Notable is the extensive use of "smart" in quotations, indicating the speculative desire for technologies to meet changes to energy infrastructure. The "Grid 2030" image provided at the end of the report, displays a map of the continental U.S. covered by a pulsing field of yellow concentric ovals, each of which connected to an array of greater or lesser circles arranged nodes in a star network topology. [**Figure 32**]

(1) Increased use of digital information and controls technology to improve reliability, security, and efficiency of the electric grid.
(2) Dynamic optimization of grid operations and resources, with full cyber-security.
(3) Deployment and integration of distributed resources and generation, including renewable resources.
(4) Development and incorporation of demand response, demand-side resources, and energy-efficiency resources.
(5) Deployment of "smart" technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for metering, communications concerning grid operations and status, and distribution automation.
(6) Integration of "smart" appliances and consumer devices.
(7) Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning.
(8) Provision to consumers of timely information and control options.
(9) Development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.
(10) Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

Figure 31: Elements of a Smart Grid (EISA Section 1301)

Figure 32: Grid 2030 (D.O.E July 2003 Report)

Three components in particular typify this 30-year trend to "smarten up" the energy sector, providing insight into what makes a given technology smart for policy makers. First, *precise digital measurements*, capable of real time monitoring, seem to form the nucleus of smart energy technology. From the earliest smart meter patents to EISA's elements, being able to have instantaneous feedback of discreet data across the grid is central to having accurate metrics. As Donald MacKenzie reminds us, metrics are essential to the production of facticity, as "facticity is often a precondition for liquid markets" (2009, 10).[163] Flowing from this is the *automated integration* of components, systems and standards. Protocols of M2M, policies that favor exchange against oversight, and the materialities of generation, transmission and distribution are

[163] If energy can be made liquid, futurity can be collapsed into its derivative form: futures. When speaking of financial derivatives, MacKenzie sees facticity as intimately tied to metrology. "The measure used to determine the amounts to be paid must therefore be a 'fact': it must be an acceptable representation of the reality of which it speaks, and not be subject to manipulation." (66) If one considers the 2019 derviative market's size – upwards of 640 trillion dollars – and that a third or so was in energy commodities, we are speaking of 200+ trillion dollars prefaced on accurate measurement. Now, derivatives do not represent actual cash, but bets on the hypothetical value of an underlying asset, but these bets need accepted facts, generated by metrics, in order to hedge them. This is not to say that the legitimacy of facts cannot be questioned. In the case of the 2008 crash, the facticity of the various metrics for housing loan assessments eventually eroded. But despite the house of cards status of many associations of metrics, facts and markets, they have not ceased to be anchors upon which these pipelines are secured.

interconnected to facilitate energy's fluidity.[164] Here we see that demand response, removing barriers to adoption and maximizing data communication are treated as net positives in that they make energy markets feasible. Finally, *dynamic optimization* follows from the first two, in that a precision system that can heal, route, respond, secure itself and upgrade is not only smarter, but capable of transferring the human from the command center to the peripheries within individual nodes of control. While the prospect of a smart grid that has the 3 qualities of being self-optimized, automatically interactive, and precise to the moment sounds like the stuff of science fiction, it is more aptly the dream of a deregulated market. However, the monitoring capacity, or surveillance, necessary for this dream is more of a nightmare.

Figure 33: One of California ISO's rotating banners

Grid monitors, solar panels and data crunching. Just a quick survey reveals these 3 visual tropes adorn the homepages of East Bay MUD, Texas ERCOT, the Department of Energy, Southern California Edison and California ISO [**Figure 33**]. While the Grid 2030 graphic, included in the DOE's speculative report of the next 100 years of electricity mobilizes a pulsating field of electricity enabled by a star-network topology [**Figure 32**], the imagery of the

[164] The problem is infrastructure is hidden through smooth operation. Looking to moments of policy adoption and its dissemination to the public becomes important, because disruptions and breakdowns only demand attention until things go "back to normal." How policy in turn interfaces with technology is important for seeing the political work the device is doing. In my second chapter, I show that this automated integration of apps and platforms through an A.P.I. is essential for the free flow of both command functions and data across software while remaining neutral to the architectures and languages of one biome vs. another. Furthermore, this automaticity is also essential to the process of valuation, as data points can be made to socialize across ecosystems like assets.

present moment differs substantially in its impact. Take, for instance, one of CA ISO's current rotating banners: operators sit surrounded by screens in a larger open-space design, similarly blanketed by a wall of monitors. The banner is striking for the juxtaposition of images therein: topographical maps, market readings, bar graphs, data plots, geotags; this command center of energy markets and real time monitoring pushes the value of a smart grid. Amidst the perpetual data gathering, someone is always watching and responding to minute fluctuations, and they are there to help in case something goes awry. Workers are represented at the ready, whether 'on the line' or just 'online', a visual trope not at all unique to CA ISO. Images of data-driven monitoring, information access via smartphone apps, or just 1's and 0s against an esoteric chromatic field are ubiquitous. While line workers in hardhats show up on most energy websites, it is notable that photovoltaic panels are ubiquitous. As images of grid monitors abut solar fields and information networks, the rhetoric becomes quite clear: the smart grid of the future is already here. No longer just an aura of electrical futurity, these images show the brick and mortar (or more accurately sun and data) out of which the future is constructed. In comes the sun, along goes the data, and out comes your energy readings…click here to login and pay your bill. But the aforementioned component values of the smart grid – real time precision, an API-like interactivity, and an information network quality for self-healing or re-routing – is always already an ambition that must be materialized in the grid and articulated through a visual rhetoric. In the end, or perhaps at the beginning, so much is prefaced on a tiny little device that interfaces with the home, and in so doing makes present the future grid.

Inside Out

In 1970, Theodoros G. Paraskevakos filed a patent for a machine that he been developing – one that could transmit information by generating and decoding pulses of electrical signals

across a telephone line. Designed while working with Boeing, this patented machine (The Decoding and Display Apparatus for Groups of Pulse Trains) was the first working example of caller ID [**Figure 34**]. By overlapping a plurality of pulse trains into the call itself, the signal became a data carrier, allowing the two machines to generate, transmit and decode a string of numbers betwixt them [**Figure 35**]. Paraskevakos imagined his system to be useful for all manner of small business needs, law enforcement investigations and as a convenient feature for everyone else (1974). Prior research into caller ID conducted at Bell Labs under John W. Gooderham (1942) and Franklin A. Korn (1941), had focused on methods for automating and guaranteeing the line number stated by a caller with the switching station responsible for the call's connection and toll.[165] These required a centralized hub with hundreds of transformers that could verify the number through either printing an automatic register or proving it to the operator through a tone in her headset or a display. Paraskevakos' schema differed because it relied on a purely electrical system, placing the circuitry at the encoding and decoding poles of the telephone network. Thus, he bypassed both the deficiencies (cost, maintenance, unreliability) of the electro-mechanical systems and utilized the channel as a transport system. In the future, as computing capacities developed, almost anything could be encoded at the gateway and transported along the phone line. Within a few years, Paraskevakos had filed numerous patents for technologies which retrospectively are labeled "machine to machine" (M2M), the most

[165] The phone company built upon this work, achieving this automaticity of billing and switching via tones that allowed their network to route calls without the labor force of a previous generation of predominately women operators. This automatic switching enabled some of the earliest "hacker culture" in the form of the phone phreaks who would whistle tones in order to make free, long distance calls in the 1960s and 70s. John Draper, for example, discovered that the toy whistle in Cap'n Crunch cereal boxes would hit the 2600 Hz tone, allowing him to access the carrier line and make free calls. "Captain Crunch" as he was affectionately known, inspired others with builds of "blue boxes," inspiring new generations of homebrew computer makers like Steve Wozniak and Steve Jobs to make their own (Levy 2010, 251).

famous of which was the apparatus for remote sensor monitoring, metering and control: the first smart meter (1980).

Figure 34: First device for decoding electronic caller signal (Credit: Theodore G. Paraskevakos).

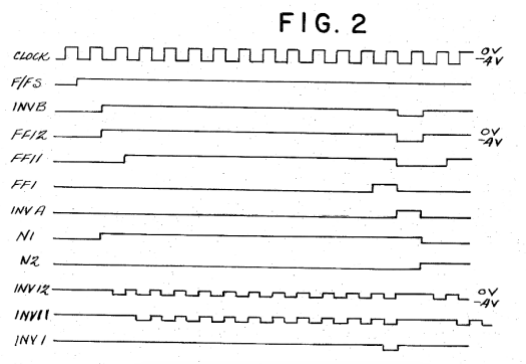

Figure 35: Overlapping Electrical Waveforms generated by Parskevakos' Invention (1974)

Smart meters are one of the earliest, and most ubiquitous, examples of physical computing embedded into homes across the developed world. As is the case with all physical computing systems, they are comprised of physical sensors, processors and actuators integrated into a complex feedback loop that responds to external stimuli or device history. It is estimated that the number of IoT (Internet of Things) devices will surpass 75 billion worldwide by 2025, further normalizing these nonhuman, M2M socialities that are imbricated in patterns of life. Meters communicate with an array of components for refrigeration, heating, lighting, ventilation, cooking, voice commands, air conditioning, irrigation, entertainment and more to communicate data, although these connections remain largely outside active human perception (Statista 2016).[166] Smart meters, in particular, are estimated to reach 80% saturation in U.S. households

[166] If this label of sociality applied machines in reference to the physical interactions, communications, and associations gives my reader pause, perhaps "actant" (Latour 1987) or "agencement" (MacKenzie 2009) conveys a more comfortable association. Here, however, I am specifically naming them as social, because out of these interactions the social is constructed. The borders of public and private, of network and grid are being negotiated in the background; in the fore lies all manner of communication for work, entertainment and intimacy enabled by these

by 2020 (Williams 2018). Integrating these meters into the electrical grid was a largely public endeavor, and as such these devices provide an interface for the goals of public policy and the dreams of IoT. Simultaneously, they have stirred up growing concerns over privacy. Today, these gateways mark a precise location where the surveillance of everyday life has come to redefine the borders of privacy and living, all while disappearing their politics into a settled infrastructure. Meters and metrics are seamlessly woven into patterns of life, and if awareness of their surveillant capacity comes, it is always after the fact.[167] Metering as "surveillance" often fails to condense around the media of home automation and data visualization precisely because the systems collecting and arraying the data are not telephoto lenses held by surreptitious voyeurs. Even recourse to the language of optics fails us because there is no eye/I behind a camera; instead we have automatic, remote data being pushed in real time to energy providers and the strange pleasure in witnessing our energy differently-graphed when we make changes to our daily energy use.

As the infrastructure for energy generation is increasingly distributed, and the dreams of a "Smart Grid" are grounded in steel girders, photovoltaic cells, and energy management devices like NEST across the U.S., interrogating the relationship between smartness, the technologies and metrics of data collection and the speculation and investment in future grids is of utmost necessity. Because the home was the architecture that established the legal conception of privacy, and its sanctity marked the grounds for 4th amendment protections, articulating the

nonhuman associations. To discount these is to misrecognize the mediation necessary for the construction of the social.

[167] Early concerns about smart meters centered on the density of the radio waves that they utilize to transmit usage information back to headquarters, as radio frequency was claimed to be carcinogenic in high doses. Yet according to the SmartGrid Consumer Collaborative, these meters have been shown to emit negligible levels, well below those of cell phones and microwave ovens. Those who have chosen to opt-out of the smart meter – out of either radiation or monitoring concerns – encounter everything from yearly fees on one end or arrests on the other (Hart, 2018). Worries about radiation that persist, are oft relegated to conspiracy theories and websites that proliferate by further collapsing the distinction between virality and virology, such as those presently advanced around 5G technology.

implications for both privacy law, sanctuary and what a "smart" technology can do becomes pertinent. State and corporate politics get played out at the threshold of the home, and the invisibility of this infrastructure of surveillance is key to its success. By looking at the changes to energy policy and development in the U.S. at the outset of the 21st century, we can see how material and semiotic changes to the state's infrastructure for energy generation, transmission and distribution (i.e. the development of the "Smart Grid") made necessary the integration of monitoring systems at and within the confines of individual consumer residences. These significant changes positioned the home – which had stood as the juridical and metaphorical foundation of United States privacy law since the time of the Revolutionary War – as a fecund interface for a range of social, corporate and state surveillance practices. The significance of the door of the home as hinge between public and private, attested to by years of legal precedent that guarantee access to the space and its private communication under very limited conditions, is in turn subverted by these alternate gateways and speculative futures.

Making Smart

"Smart" as an adjectival modifier for computational technologies was a metaphor largely birthed in military-industrial research from World War II until today. The terms ubiquity in public discourse can be traced to the First Gulf War in 1990 and the computer and soldier-guided smart munitions used to target the bunkers of senior Iraqi officials. Here, smartness achieves prominence in the correspondence of a radio, laser, infrared or GPS targeting system and the felicitous impact of the explosive device; 'smart' collapses into a pun on intelligence and its resounding sting. As the top-down videos of crosshair-superimposed explosions were mediated to the public in news and military propaganda, the nomenclature of precision-guided, or smart, munitions entered the public imagination. 'Smart systems' reach public awareness via the smart

bomb, yet the term circulated earlier in the 1980s in scientific and defense research with the arrival of compact computers. Together with its network of sensorial and actuator arms a "smart system" collects data on their history or environment, processes that information, and responds, "by changing its characteristics in an advantageous manner" (Goddard et al. 1997, 130). Paul N. Edwards locates the seeds of 'smartness' in the military-industrial partnerships that promulgated both integrated circuit development, and artificial intelligence research in the 1960s and 1970s (1996, 66). Since the work of Alan Turing in WWII, Edwards shows, the tracks for intelligent or smart machines were consistently laid – whether in pure theory or silicon chips – within a militarized framework and with defense funding.[168] For example, cheap, integrated circuitry developed from Jack Kilby's 1958 design and Robert Noyce's 1959 "monolithic" improvement, was immediately put into service of the Apollo missions before they could become financially successful at Texas Instruments or Intel respectively (Parker 2003).[169] Over 1 million of these computing circuits were purchased from 1962 and 1967 for the guidance systems which made the lunar dream possible, because miniaturization superseded cost in importance (Hall 1996, 1-18). This explosive dissemination of semi-conductors can be seen in the years separating Paraskevakos' patents: the caller ID apparatus developed in 1969 surmises that discreet components might be swapped out for integrated circuits in the future (13), while his "sensing

[168] While Edwards is referencing the period immediately following the close of World War II until the collapse of the Soviet Union, effectively limiting his focus to the Cold War, the conclusions he draws allow the reader to connect the war computing to the computerization of society. We might not live in the historical period, but the technologies developed in conjunction with US empire-building have been effectively filtered into day-to-day interaction with computers. What is the closed-world discourse Edwards articulates? "Closed-world discourse, through metaphors, techniques, and fictions as well as equipment and salient experiences, linked the globalist, hegemonic aims of post-World War II American foreign policy with a high-technology military strategy, an ideology of apocalyptic struggle, and a language of integrated systems." (8) It is significant that he begins with Turing, because Turing's test – however queer in its analogizing of gender to intelligence in a sort of dating game – makes intelligence into a trickster's competition, encoding semiotics with behavior.

[169] In fact, according to Parker, 60% of the global supply of integrated circuits were consumed by the joint NASA/MIT research program (2003, 5). Alternately, according to Edwards, almost 80% of ALL artificial intelligence research was funded by ARPA, despite the fact that no commercial use had yet been demonstrated (64).

apparatus (i.e. smart meter) is necessarily constructed around an integrated circuit CCPU (1980, 24 & 26). While the semiotic designation 'smart' hasn't been self-applied, the components and processes evidence a common ancestry.

Paraskevakos' not-yet-smart meter differed from predecessors' in proffering communication from the remote location, reimagining control as something to be distributed, not centralized. Meters have always been a necessary component for centralized utilities such as water, gas or electricity due to their ability to measure the flow into or out of a home or business for billing and safety purposes. These analog devices would measure total consumption, and are read by a large staff of utility workers on a monthly route. Paraskevakos' device built upon his caller ID system so that the meter itself, connected to a phone line, "initiates communications at predetermined intervals" with the central complex (1980:1). The device continued the M2M logic, agnostic to the flows being metered or the types of data it carried. As such it could be useful for numerous remote metering scenarios, and could be iterated upon with all manner of emerging tech: RAM to store more minute data when transmission wasn't feasible (27), harmonic transceivers to convert signals into a local alarm or shutoff commands in order "to prevent overload or brown-outs" (4), and real time displays of power usage onsite (5). When turning to the definitional evolution of smartness occurring through energy policy, it is this modulating ability that earns Paraskevakos' invention the label of smart in my estimation.

In both the meter's modifiability (i.e. upgrade capacity) and its capacity to transduce electrical currents moving through infrastructure and architecture, it is a modulating device. "Modulation," argues Mark Andrejevic, entails, "constant adjustment designed to bring the anticipated consequences of a modeled future into the present so as to account for these in ways

that might, in turn, reshape that future" (2012, 96).[170] With M2M technologies like the smart meter, human feedback typically occurs "offstage" for electrical systems operators. What is displayed to the end user through platform interfaces, or statistics graphed post-facto from power use, is never the same. As such, the smart meter is responsible for modulating the material conditions of consumption with generation in energy networks, all while retroactively locating the human through the switches and signatures of the home and its devices. Like the women computers who turned the drums and connected the cables on the Colossi and the ENIAC, human action is responsible for transporting data-as-energy through the home as physical computer. Furthermore as "smartness" becomes tied to infrastructural development and deregulatory policy in the energy sector, we see "smart" – and its ubiquitous monitoring – as a necessary precondition for futurity.

The precision of smart meters is remarkable, disturbing, and quite unlike any technology of its era for mapping the activities of a user. Minute changes in energy consumption can be traced to a single device within the home in near real-time. Over a particular duration that means that these monitoring gateways could map the daily activity inside of a home with relative accuracy. Imagine a database that records, at 6:02 every day, a 14-watt increase (most likely a single CFL bulb) followed by a metering of 4000 watts (electrical water heater) for approximately 15 minutes. Or how at 6:30 everyday, a median of 1000 watts are logged over 10 minutes followed by a reduction to 500 for an hour (coffeemaker), yet today the system logs 1400 watts followed by a reduction to 500 for two hours. Does someone know the time and

[170] Andrejevic argues that predictive analytics, sentiment analysis and controlled experimentation are strategies central to the monitoring of populations that ubiquitous surveillance renders possible (94-95). In this passage, he is speaking of the Nielsen rating system, and how commercial businesses utilize sentiment analysis and interactive feedback as a way to pre-empt bad products and produce new markets/connections (95). I would add, that modulation is also the very heart of predictive analytics and experimentation in the energy grid, as being able to balance generation and distribution in real time and experiment with supply and demand across economies of scale is key to making/saving money in the energy sector.

length of your morning shower in the first scenario, or that you had guests stay over in the second? In short, yes, and depending on the particular energy market in which a home is found, it has technically been possible for over 30 years. Lest my reader think I am being hyperbolic, consider a report generated in 1984 by George W. Hart for the nonprofit Electric Power Research Initiative. In his report, Hart, an MIT mathematician detailed the progress his energy lab had made in developing what he called a nonintrusive residential load-monitoring device, feasibly constructed with low cost sensors and microprocessors. Once a sufficient algorithm had been devised, and real time measurements are made at the kWh power meter socket, Hart claimed that "appliance signatures…can be observed in the aggregate load," allowing determination of the devices running inside of the home (1-2).[171] While the "smart" terminology is absent in Hart's report, developing "learning algorithms" that can be tested in "real time" is central to his work (31). Hart's improvements to the smart meter in 1984 and 1989 eventually realized this ability to develop waveform signatures of home appliances by monitoring the load at the energy socket [**Figure 36**]. In an article he wrote for the Institute of Electrical and Electronics Engineers (IEEE), he lists 24 appliances [**Figure 37**] they could identify with 90% accuracy at 3 different test locations by treating the objects as transmitters regardless of the noise from the total load: "It is easy to tell when someone is in the shower, for example, based on the use of a water pump, water heater, bathroom light, and/or hair drier" (1989, 13-14). Because the value of his meter lies in data acquisition and its use for determining signatures, he is fearful of its futurity. His worry is that the data generated at the home *will be useful*. As public utility commissions, energy providers, policy makers, appliance manufacturers, conservation-minded homeowners and law

[171] The conservation efforts of PURPA can be seen in Hart's work, as finding and tracking the least efficient appliances becomes important for decreasing demand.

enforcement agents utilize his device, monitoring will become routinized surveillance in the near future (14).

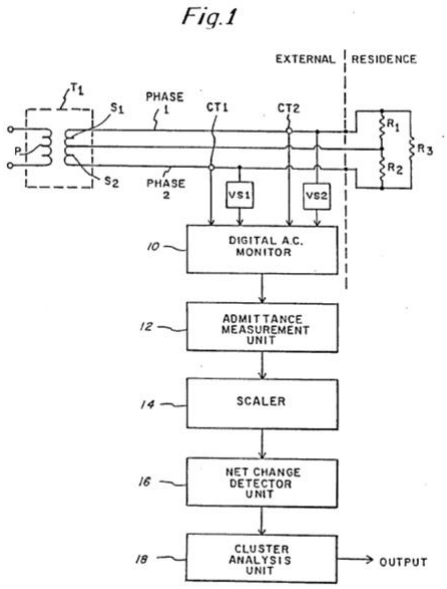

Figure 36: *Non-Intrusive Appliance Monitor Apparatus* (Hart et al. 1989)

TABLE I

List of Appliances Identified and Monitored in Tests of the Prototype Nonintrusive Appliance Load Monitor at Three Field Sites

Refrigerator	Dishwasher
Bar Refrigerator	Toaster Oven
Freezer	Hair Drier
Ice Maker	Water Bed
Oven	Hot Tub Pump
Large Burner on Stove	Basement Lights
Small Burner	Kitchen Light
Oil Burner	Food Processor
Iron	Water Pump
Bathroom Light	Hot Water Heater
Washing Machine	Dehumidifier
Drier	Garage Door Openers

Figure 37: Identifiable Appliance Signatures (Hart 1989)

Smart Surveillance

Hart's article is notable not for the disturbing capacity of his technology, but due to the explicit framing of his device as "computerized surveillance." With this frame, he raises questions regarding who can access, control, and own electrical data, the massive disconnect between consumer knowledge and technical capacities, and the fundamental privacy and civil liberty concerns raised by his 'nonintrusive' device. Opening with an epigraph from the 1890 article in the Harvard Law Review written by Samuel Warren and Louis Brandeis entitled "The Right to Privacy," Hart situates his technology amidst a discourse on the right to be left alone in one's home. With the smart meter, the inner goings-on in the home, once our bastion of privacy – our castle amidst the searches of both "constituted authority" and "prurient curiosity" – are revealed to the eyes of third parties and displayed back to ourselves in small measure (Warren &

Brandeis, 220). The fourth amendment to the U.S. constitution was explicitly concerned with preventing general warrants and searches, or writs of assistance, that had become commonplace under British rule. Privacy is marked at the property line wherein, "the individual is entitled to decide whether that which is his shall be given to the public" (199). Legal precedent extends that line to a public phone booth where one has a reasonable expectation of privacy (*Katz v US 1967*), later prohibiting externally-garnered data from a thermal imaging device from reaching across that border (*Kyllo v US 2001)*.[172]

The artificial borders of privacy are first transgressed by Third Party doctrine, and continue to struggle with data driven surveillance methods. Third Party doctrine, argues that because we are already giving our information to the phone company (or the electricity provider), who and when we call is not private even if the contents of that call might be (*Smith v Maryland 1979*). The difficulty with electricity, though, is that this monitoring gateway conveys pattern of life far in excess of phone metadata, and yet is largely invisible to the residents of the home. When he polls his fellow engineers and scientists about the dangers of his nonintrusive technology, Hart discovers the common response is that "all technology will be abused, but [they] consider it outside of their purview to act to prevent it" (15). Unfortunately, there is not much recourse for preventing this abuse, as 3rd party doctrine has provided law enforcement repeated access to thousands of energy readings without warrants over the past decade, most of them in search of marijuana-growing operations (Smith 2012, Baker 2013). While the 7th Circuit Court of Appeals established precedent in 2018, which overturned a previous decision that had ruled smart meter data as unprotected from 4th Amendment protections (*Naperville Smart Meter*

[172] In his opinion on *Kyllo*, Justice Scalia even laments that with such technology we might know "at what hour each night the lady of house take her daily sauna and bath," further complicating imaging with the intimacies of pattern of life surveillance (*Kyllo v US 2001*).

Awareness v. City of Naperville), a decade of smart meter data collection shows the juridical lag between a new technology and legal protections.[173]

Problems with privacy have always extended from new concerns over mediation, and while often protected at the borders of ownership in US law, privacy and property cannot be equated.

New technologies and media avenues of mediation are regularly the places where "privacy" is negotiated and defined, and yet never quite settled. This can be seen in the legislation and arbitration around the collecting, storing, and accessing of license plate readers, GPS systems, energy meters and internet metadata by law enforcement agencies. In the history of privacy law in the U.S., enforcement agencies tend to play right at the border of what is legally acceptable (Farivar 2018, xii). In the 1961 Supreme Court case *Silverman v United States* the justices ruled unanimously that even though law enforcement did not trespass the walls of the home, connecting a 'spike mic' to the target's heating system was an intrusion (Farivar, 15).[174] Because the borders of legality (and its trespass) are constantly renegotiated by new media, Warren and Brandeis' right to privacy is grounded not at property, but within a larger "right to be let alone," a concern that, for the authors, issues forth from the photographs taken or published outside of our discretion (1890, 195). Ownership isn't a sufficient ground for privacy, precisely because personal appearance, relations, sentiments, and thoughts are not something owned (213). Importantly, albeit strangely, the authors situate the right to be let alone in English common law, which draws upon older Roman colloquialisms of the home as the refuge or sanctuary for its

[173] Naperville was a bit of a unique case, because it is the City itself that was collecting the data. The court distinguished between data types: 1. Those data collected to maintain and improve the grid, and 2. data for prosecutorial intent. In the latter case, warrants are required; in the prior instance, it is not an unreasonable search to collect information for the efficiency of the system. A similar bill failed to progress in the Maryland State Legislature (HB56) in 2018, meaning that depending on where your home is, your pattern of life is more or less accessible to law enforcement with a subpoena.

[174] "Since the eighteenth century some of the most aggressive law enforcement officers have known precisely where the legal limits were, and gone right up to them" (Farivar, xiii).

inhabitant regardless of ownership. Invasion, intrusion, injury: these are the words that signify violation of the refuge of one's castle. But because it hasn't pierced the defenses of the home, the meter has not invaded. In Hart's own patent language, it is "nonintrusive;" after the moment of adoption, in fact, it is largely invisible. And due to the possibility of cheaper bills, it isn't injury that it proffers but protection from the charges of energy providers. This integrative role of the meter in connecting the grid and the home in a nebula of "intelligence" masks the massive monitoring, storage and analytics of the surveillant meter. In its rhetorical and computational instances, who can argue with making something smart?

Beyond the directionality of viewing, it is the misrecognition of surveillance as optics that keeps monitoring outside of the critical purview of the user. In their article on sousveillance, or 'watching from below', Mann & Ferenbok claim that "technology is one mechanism that can help mediate the asymmetries of power between a viewer and the subject" (2013, 26). They provide the example of life-loggers who regularly stream continuous video from wearable cameras years in advance of AR technologies like Google Glass. It is their argument that everyday users, in their ability to archive and evidence, "the practices of institutions will by necessity change the way institutional and state surveillance systems are organized, implemented and managed" (31). An example of this argument can be seen in the work of Hasan Elahi, and his ongoing *Tracking Transience* project, wherein following his multiple interrogations by law enforcement at airports, Elahi regularly sends the F.B.I. massive uploads of his daily activities and location. But is this method of sousveillance successful for changing the patterns of dataveillance from law enforcement? This hypothesis seems insufficient in the case of police, as police departments outfitted with body cams did not seem to affect the use of force by

comparison to those without the technology.[175] While footage could now be used to train officers in the future, and possibly be used in court cases against those committing police brutality, it questions the capacity of sousveillance to counter the exceptional force from surveillant systems. While videos uploaded by users have made some inroads to sparking public outcry at police brutality, they still operate in the realm of optics. What of the stingrays, automated license-plate readers, or UAV's monitoring from 10,000 feet? These exist outside of the eyes or perception of any user or participant with sousveillant capacities. Returning to energy metrics, there is no equivalent system or database that could be used to counter the mass of this system view.

Responding to power systems, and the hidden systems of power they incarnate require technical proficiencies largely outside of the average citizen's abilities. In December 2011, Dario Carluccio and Stephan Brinkhaus presented their team's work at the 28th Chaos Communication Congress (c3), entitled "Smart Hacking for Privacy." C3, an annual conference held in Germany, conducts lectures, workshops and promotes collaborative projects for those at the forefront of questions of privacy, cryptography, hacking, free speech online and infosec (information security). In their talk, the presenters demonstrated some of the security flaws in the smart meter made by the German company Discovergy, a device picked because it is one of the only meters available to German households that is not installed by energy providers (Carluccio & Brinkhaus 2011).[176] Building upon Hart's work, they hacked their own smart meter to monitor the house's load for power consumption levels that fluctuated with the activation of light emitting diodes on a television screen. By comparing the relative brightness over a five minute

[175] https://bwc.thelab.dc.gov/#home Combine that with law enforcement efforts to subvert the sharing of user's video of police arrests – for example, by loudly playing licensed songs in the background so that algorithms filter out the content from youtube, TikTok, etc. – the idea that sousveillance can balance the asymmetry of state power and dataveillance is inadequate.

[176] The presenters distinguish "smart" meters from the standard electrical power meters for three reasons: they digitally render precise measurements, have memory (i.e. store data over time), and permit the transmission of said data over networks. Smartness for them is situated in their expertise of electrical engineering and infosec.

time period – double checked against numerous television screens with differing wattages, and compensating for the noise in the system from other active devices – they were able to build predictive models which guessed films being watched. Beyond patterns of life garnered from metadata, Carluccio and Brinkhaus' work revealed the theoretical capacity of machine-to-machine dataveillance – one that might reveal the very content of communications.

This level of detail was possible precisely because the presenters were able to throttle the meter's duty cycle to match a time of monitoring that could collect more discreet intervals of data for recording purposes. Additionally, using the smart meter's MAC (media access control) address, the presenters were able to show the lack of security in the company's web interface, spoofing consumption metrics back to the company with thousands of negative hours of energy consumption, and eventually displaying the message "U have been hacked" back to the provider in their usage data [Image 7]. This is why disturbing a meter, spoofing metrics, i.e. undoing facticity is so dangerous to the smartness of meters and grids, and why tampering with the device elicits fines or even police presence. The precarity of these systems, and whether or not they have been secured is disconcerting when considered from the point of view of the home, because the status of the energetic monitoring (and the system's insecurity) is outside of the majority of citizens' knowledge. Furthermore, the lack of understanding about the feasibility of types of longitudinal analysis and cataloguing (which would enable determination of content on my TV) is part of the point. Has this practice become commonplace, or is it science fiction? The variation between duty cycles (how long the meter sends RF bursts to the utility company in a 24-hour period), make it hard to determine this with accuracy. Shifitng regulatory policies across national or state lines, or introducing additional gateway (e.g. NEST) makes knowledge of the timescale quite opaque. While some companies might push burst of data a few times an hour or a day,

others have been shown to send pulses over 5 times per minute (Sierck, 7). Given the move to demand response systems, will my energy eventually be throttled for certain kinds of behaviors? What is clear from the history of smart meter development, implementation and hacking, is that energy infrastructures are largely invisible to those for whom they operate smoothly.

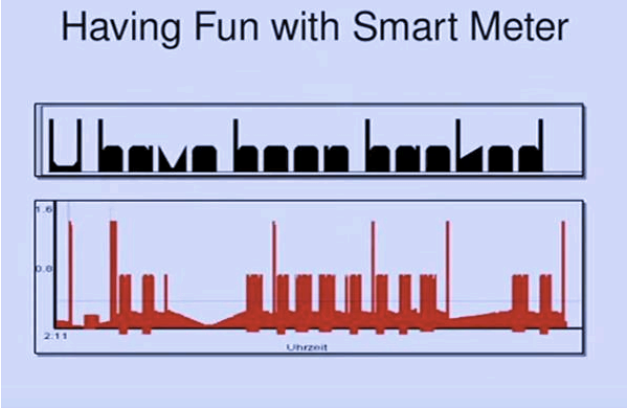

Figure 38: "Smart Hacking for Privacy" (Credit: Carluccio & Brinkhaus)

Being surveilled – literally, "watched from above" is a concept embodied in the eyes and I's of human perception, a perspective cinematically reinforced through a play between heightened visibility and situated invisibility. The first minutes of Francis Ford Coppola's 1974 film *The Conversation* deftly combines image and sound to place us into the eyes, and ultimately the paranoia, of Harry Caul (Gene Hackman), an audio surveillance expert who slowly unravels amidst his work of tracking and recording others. An extreme long shot, angled high above Union Square in San Francisco, is aimed at human bodies, moving like bugs about the rectangular space as brass plays a lively tune in the distance. Slowly, almost imperceptibly, the camera pushes in to the frame, relentlessly moving forward and encroaching upon the square. Distinct figures – a dog, a mime, a man in a trenchcoat – are framed and captured by the advancing camera. Into the image cuts an other-worldly sound, a loud warble of audio that becomes more frequent through the sequence, clashing with the diegetic sounds of barking dogs

and musicians. The camera's perspective, its persistent track into the square, and the source-less, alien sound places the viewer into a surveillant gaze. The long take lasts three full minutes as our view advances, monitoring those going about their days before we cut to the source of the view and audio signal: a man perched atop the City Paris building, aiming into the square like a sniper with a long-range directional microphone. Physical eyes and ears extended via optical and acoustic technology perceive those who don't perceive back. Movement here occurs within a field of the eye's (and ear's) possibility, and yet is always partial and restricted by the directionality of listening and vision. Here, surveillance fits. But what happens when surveillance is brought out of the realm of the visual, and the directional?

Historically, surveillance studies itself has often been caught within the scope of the visual, a history regularly repeated from its etymology to a history of citation that moves from Bentham's "panopticon" through Foucault's "disciplinary society" to arrive at Deleuze's "control society." Examples abound, but Greg Elmer's "Panopticon – Discipline – Control" charts some of this lineage of thought and offers the critique that panopticism, as it plays out in Foucault's *Discipline and Punish*, is more about the assumption of being watched than the position of always watching.[177] Elmer might be helpful for this corrective to the directionality of viewing, and for showing Deleuze's debt to Foucault's thinking re: control, but he remains stuck in the visual. The diagrams of surveillance offered by Foucault and Deleuze are helpful for articulating relationships of power, but deferring to optics misses the ambivalence of systems of sensing, and their intersections with one another. We don't have to default to visual perspectives that fit subjects into systems of discipline (Foucault 1995) or alternately, divide them across

[177] Elmer suggests that surveillance scholars have selectively read ideas like panopticism through Foucault's metaphor without adequately engaging Bentham's liberal, humanist model on its own terms to note the discrepancy (22). While Elmer's intervention works for scholarship being written in the 1990s and early 2000s, it is largely unhelpful for the surveillance occurring daily through sensors, site traffic and meters.

societies of control (Deleuze 1992). In fact, the tactile and rhythmic dimensions of both discipline and control can be seen in those sources.

These two structures of power can be seen as alternating currents in the mediation of the smart meter. Like the effects of dressage upon the body of the horse, discipline is meant to create a docile political/economic subject. (Foucault, 138).[178] The elements necessary to establish the disciplined subject – hierarchical observation, normalizing judgements and the examination certainly match with both the conservationist drive of smart meters, not to mention the feedback provided from energy providers or even the most contemporary instantiations of monitoring in devices like Google's Nest (172-184). But here any vision is always reflexive, and no observer lurks outside of the system metrics. Seeing the green leaf on a home Nest display to indicate energy efficiency, or tracking the consumption of the house against a day or month's graphed metrics, enables evaluation of individual-as-home against a standard or model. Hart's concern with signatures, while focused on the nonhuman elements in the system, certainly matches a disciplinary regime of power. On the other hand, the grid that opens Foucault's panopticism – the city segmented in response to the plague – bears little resemblance to the grids that want to be markets.[179] The individual here, is now the home, yet the home as one repeating unit in a larger relation of control that is not centralized.[180] If there is a center, it is everywhere and

[178] "[Discipline] dissociates power from the body; on the one hand, it turns it into an 'aptitude', a 'capacity', which it seeks to increase; on the other hand, it reverses the course of the energy, the power that might result from it, and turns it into a relation of strict subjection."[178]

[179] "This enclosed, segmented space, observed at every point, in which the individuals are inserted in a fixed place, in which the slightest moments are supervised, in which all events are recorded, in which an uninterrupted work of writing links the centre and periphery, in which power is exercised without division, according to a continuous hierarchical figure, in which each individual is constantly located, examined and distrusted among the living beings, the sick and the dead – all this constitutes a compact model of the disciplinary mechanism" (Foucault 197).

[180] In 2013, a family in Long Island was investigated and questioned by the police following a night of regular internet browsing that lead to police intervention. While I mention this a bit in the conclusion, it's worth noting how "the household" is collapsed into IP address data, in much the same way as human action is collapsed into the home's energy identity.

nowhere [See Image 4]. The modulation at the gateway of the smart meter is central to the power exerted by control: "the numerical language of control is made of codes that mark access to information, or reject it" (Deleuze, 5). Control breaks up the political/economic subject into its dividual components – here a refrigerator opening, there a lightbulb switched off. Control, importantly, happens at these M2M boundaries – these territories crisscrossed by vectors of energy, pulse trains of information and gateways of transduction – not at a command center. Even the memory of their crossing, is stored across servers for redundancy, a logic of database that is less 'base' than 'outpost'. Discipline is how smart systems look from metrics and visualizations revealed to users, who respond in order to fit, or adapt to excessive outputs or expenses. Control, conversely, is how smart systems function below the application layer, moving energy and numbers outside of the user's purview .[181] But zooming out to look at the larger grid, do we experience something more exceptional?

In a public lecture UCD Professor and cryptographer Phillip Rogaway made the following statement: "The most **basic** characteristics of our communications infrastructure are now **secret** and probably **unknowable**" (Sept. 22, 2015, his emphasis). Commencing a year of public lectures from leading historians, lawyers, academics and journalists brought in to speak on a nexus of themes including surveillance, privacy, networked society and governance, Rogaway named a specter haunting contemporary information systems: a level of inaccessibility and illegibility in the protocols of power and surveillance. His lecture evidenced the untenable nature of privacy amidst this combination of secrecy and complexity. As someone who both theorizes

[181] While states, cities, energy providers and even independent service operators possess more or less detailed metrics and varying views that seem "bird's eye," they are working with facts generated across space and time and with an understanding that is always piecemeal. Because grids are a logic – of free interconnection and transmission agnostic to generation and distribution sites – the knowledge depends upon both the grid under consideration and the load moving through the system. When they are out of phase, blackouts, brownouts, fires and failures proliferate.

and designs encryption, Rogaway pinpoints this problem of scale and misrecognition of access that neither control nor discipline quite articulate. Put differently, there is no one person who can grasp what is occurring within our massive surveillance apparatus. There is no position from which to command it in its entirety or survey it longitudinally. It is, quite literally, beyond the scope of human intelligence, or 'smarts,' as it continues to expand to fill a backdrop to, and punctuate, our everyday lives. Yet lives are indeed impacted, as our movements and livelihoods become increasingly impracticable without the silent hum of machine to machine interaction and metering occurring in all of our social spheres.

There is an everydayness that comes to define surveillance outside of the optical mode. With energy monitoring, it becomes woven into the social fabric of our home life, follows us to measurable units in our work and is fed back to us through platforms as metrics for improvement and conservation. The words of Henri Lefebvre that opened this chapter, follow a section wherein the author pushes readers to look behind the apparent solidity of a 6-storey apartment building on a city street. At first glance, these places are the very essence of the concrete: in their composition and immobility they evidence property lines, mark off species of transit, and extend the very ground of public/private. But behind load-bearing brick veneers and below miles of painted asphalt lie more complex spatial realities – rhythms, intersecting flows, waves of motion. Tapping into these flows are systems of metering and modulation, silently collecting, storing, and responding to the data. Conduits of water and gas, cables of electricity and telephony, and waves of radio and human movement suffuse the membrane of the house's façade: "[This] piece of 'immovable property' is actually a two-faceted machine analogous to an active body: at once a machine calling for massive energy supplies, and an information-based machine with low energy requirements." (Lefebvre, 93) When we begin to alter these places in which we move

intimately and open them up to surveillance (self, state, corporate or *merely* social), we change the social body – in its understanding of property and privacy, its connectivity or enclosure, and its performance in relation to standards (e.g. smartness, resilience, efficiency). While Lefebvre was writing in 1974, before our digital episteme had proliferated in optical bands buried beneath pavement, or reverberated through the aether at 5 gigahertz, he grasped this abstract diagram of the home, and those bodies rhythmed in service of its operation and consumption. That diagram is not gone, but morphing; today we have labyrinthine corridors of data alternately assembled into patterns of usage, pictures of efficiency and targets of consumption – all mapped to the fluctuations of the house in real time. As we find ourselves at home more in light of the present pandemic, we must attend to the devices which increasingly populate, measure, catalogue and control our domiciles with social relations that are outside of our control, yet provide meter and tempo to our lives by their very presence. What systems are we building through our movements, and what new enclosures or openings do we find in response?

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CODA – Veiled Performance

In 2013, a Bolivian family in Long Island was investigated and questioned by the police following a night of regular internet browsing. The previous evening, Michele Catalano was shopping for a new pressure cooker, while her husband was reading the news and her son was buying a new backpack. This was 3 months after the Boston Marathon bombing wherein the Tsarnaev brothers detonated bombs made out of pressure cookers and ball bearings hidden inside of backpacks. While Ms. Catalano argued this was an example of NSA surveillance, police say that got a tip from her husband's previous employer checking search history, compounding the difficulty with knowing where surveillance is coming from due to law enforcement's practice of parallel construction. Important here, is that the IP addresses become the points of contact; like all physical computing metaphors it serves as both a place to touch and be touched. Here we can extrapolate a central point: The user is not an individual, but a relational geography stitched together from a multitude of interactions. This is not some postmodern second self (a la Sherry Turkle), but a nodal topology collapsed into topographical relations. 'Synthetic ecology' is helpful here for reflecting upon not just the architectures of networked life, but the daily performances that pull together worlds and determine lives in the present.

A central element of my work is to bridge the distance between the more exceptional or singular conceptions of performance, with the more mundane, iterative actions that are generated through communicative media technologies. Everyday interactions – utilizing a digital platform, interfacing with social media applications or even linking with electrical grid – typically slide between multiple types of performance, often making it hard to determine the particular actors in a given moment. In "Performance and Globalization", Jon McKenzie complicates our cultural or artistic understandings of performance with the metrics, applications, and evaluations of

performance in other paradigms of knowledge across the 20th century (2001). In each of his six paradigms (i.e. cultural, technological, organizational, governmental, financial, and environmental), McKenzie locates specific (and contested) criteria used to determine, evaluate or satisfy optimal, or "good enough" performance (38-9). For example, the criteria with which we might evaluate the live performance of our favorite musician will be quite different from how we judge the performance of a student on a quiz. Likewise, we might determine that one candidate performed better than the other in a political debate, yet this set of standards is quite different than the formula for gauging the performance of a new type of fuel in an engine. It is McKenzie's contention, that these different types of performance overlap into *an increasingly-global requirement that in order to matter, they must be measurable*. Importantly, he notes the performativity of qualitative values (such as social and ethical concerns) to potentially disrupt their quantitative frames (40). Performance, then, contains a typically conservative functions of the status quo via its propagation as a model, replete with internal metrics for efficiency and efficacy, and a more progressive or disruptive capacity, when it returns with the excess of those qualitative spheres of life. "Performance", says McKenzie, "will have been to twentieth and twenty-first centuries what discipline was to the eighteenth and nineteenth: a stratum of power and knowledge" (35). The integration of new media systems and metrics into daily living, however, has synthesized much that distinguished technological and environmental performance into a background hum of always-on, opt-out, nonhuman sensibility. In these synthetic ecologies of interaction, performance is necessarily tied to surveillance.

Alternately, from the side of media studies, my goal has been to push past a prosthetic mode to an everyday understanding of embodiment and technological encounter. The "prosthetic mode" is what I call this tendency to articulate particular technologies as a means for extending

perception. The tool-object is conceived as the way we extend human agency and sensibility, rather than "an already-embodied technic for "making sense," a dynamic, material relationship of incorporation and interaction" (Johnson 2019). As I have shown, the networked digital architectures of the platform, application and grid are invested in propagating this ableist abstraction of technology. If only you utilize our system, embed this application or interconnect across this grid, we can reach our goals of sustainability, imagination, sociality, and intelligence. Vivian Sobchack traces the libidinous fantasy of the prosthetic metaphor in "A Leg to Stand On," arguing that theorists utilize the prosthesis in a sort of cyborgian celebration of possibility and human capacity (2004). She shows how this extending and enabling fantasy of technology regularly neglects the incorporative practices of those (like Sobchack) who live with, and render invisible these devices. Instead, these imaginaries transfer agency to the technical artifacts: "the scandal of the metaphor is that it has become a fetishized and "unfleshed-out" catchword that functions vaguely as the ungrounded and "floating signifier" for a broad and variegated critical discourse on technoculture that includes little of these prosthetic realities" (209). The prosthetic, Sobchack argues, functions to 'return everything to normal,' and often hides the disability behind this discursive fantasy of technology (211 & 223). With this is mind, interfacing across computational technologies is not just a requirement to participate in contemporary society, but a process of performing a new body, and a political and expressive process of improvising across different sense of space-time.

If a prosthetic is isolated from its performed system of relations, the critical analysis it permits must be named as a subtraction, or objectification, of a particular medial history. For example, when movement, targeting, and capture were collapsed into a medium, as in the convergence of the camera and the gun for Étienne-Jules Marey (1895), we can situate cinema

within a wider history of ballistics and warfare. Likewise, removing the camera from the history of physiological instantaneity – whether in Marey's myograph or the graphical marking of the body in Muybridge's pointillist field – neglects this 19th century "desire to measure and control living movement" (Cartwright). As Lisa Nakamura shows, the early rhetoric of digital networks as fundamentally democratic extensions of human identity performance – as digital playgrounds – can be interrogated as an Orientalist performance, one that she argues using the term "identity tourism" is complicated by differentials of mobility and asymmetries of power (2001). Thinking technology as means, or as prosthetic, permits us to see ways in which a particular imbrication of the body with architectural media, founds certain politics or forecloses alternative futures (Winner, 1980). But as a modular abstraction, it conceptualizes technology as somehow apart from, or added-to, embodiment. Framing a platform like Google apart from its everyday patterns of use, its emplacement as literal lens for encountering the world, and its imbrication with systems of political, corporate and electrical power, reifies a natural essence for the body and its original wholeness (Sobchack, 2004, 210). Synthetic ecology remains a helpful conceptual reorientation to this technological performance and the embodiment of processes, locating us amidst the co-constitution of everyday life and the making-resilient of digital architectures.

Practically, however, the proclivity of technological artifacts to shroud histories functional rhetoric often makes critical analysis difficult. Life lately seems tuned to the speed of computers and sensors, not concentration and sensuality. The veil of surveillance, which a good etymologist will inform me I have mistakenly transmitted and translated is not one of vision but of covering. The veil of the digital is the blanketing of vision; it removes eyes from the equation. Or if ocular, there's is a strange disinterested hole, a vacuum taking in everything and anything in its field. My advisor once remarked, "The screen is both a mirror and a veil" (Kriss Ravetto-

Biagioli). I can't think up a better image for a life facilitated through digital mediators and those interfaces that Kittler says reduces all to eyewash. This pleasures at the surface of the screen, of touching and sensing and multiplying the self through this monitoring, veils any easy equivalence with surveillance. After the wedding of the everyday to digital monitoring, however, there is no lifting of the veil. I'm still not sure what resistance looks like in this scenario. Perhaps in honor of these nuptials, this wedding of embodiment and the digital into a synthetic ecology, I can name some things to bring with us.

Something Old. Everything is already old. By the time someone reads this conclusion, I am certain this news cyle dominated by stories, internet memes and celebrities opining on Will Smith's slap of Chris Rock at the Oscars will have either been forgotten, or seem old. Writing about technologically-mediated experiences is even more fraught with difficulties. Media theory often spoke in grandiose claims of digital eras and information societies, I think, because to speak of particulars is to always be buried in the past. Every chapter of my dissertation is, in a sense, stuck in its moment of writing – a moment that might have been forgotten or destroyed by the latest patch in software, a new end user license agreement or the obsolescence of a particular piece of hardware. Stories like Ms. Catalono's must be told in the present to index a past which is continuously performed by our digital architectures. Writers must be archaeologists of the near-past, bringing artifacts into the contemporary moment, not as curators of nostalgic curios – the culture industry is already committed to the onanic celebration of its great inventors and inventions – or even as archivists of the false-starts and incremental changes on the road to some future utopia (we certainly do love our techno-progressivist narratives and schematics), but for the goal of remembering differently. We must re-member – we must put together the pieces in different times, shapes and movements. It's not just particularity that gets lost in the new, but

sameness. We forget that the promise of the new is so often built upon the same old tired inequities and injustices. Regurgitating these past moments in full light of the present shows us both the present rhetoric of active-forgetting and the laziness to address lingering architectures.

Something New. When discussing new techno-cultural powerhouses like Google or Amazon with my students, I regularly cite some 'great' technologies of the 19th century (e.g. Edison's lightbulb, Bell's telephone, Hollerith's tabulating machine) alongside their enduring corporate structures (i.e. *General Electric, AT&T, IBM*). Conjuring the old into the present helps to convey the weight of the present moment for foreclosing future possibility, but it doesn't convey the scale; the scale requires something new. Interacting with the manifold possibilities of our synthetic ecologies, whether at a screen's surface or the software's prose, requires shifting the frame of time to one that is thoroughly nonhuman, and often disorienting, to users. Kurt J. Mac is still walking after 10 years, only now disentangling the mathematical construction of *Minecraft's* landscape from his avatar's presence on the platform. Carluccio and Brinkhaus modulate their energy data for an entire month in order to feed back the symbolic "U Have Been Hacked" message constructed out of their material energy consumption. Surveillance artist Hassan Elahi records images of everything he eats, his location, and GPS tags for decades in order to deliver them as regular data dumps to the Dept. of Homeland Security in response to being mistakenly added to Do-not-Fly lists after September 11th (*Tracking Transience*). Like the data leaks that eventually reveal punctures in information security systems, glimpses of the scale of synthetic ecologies often only comes when an image of the disjointed scale of time or scope of data can be made present to human perceptual awareness. This requires a shifting of scales upon which to improvise.

Something Borrowed. Coopting some of the language of performance, or following McKenzie's understanding of 'measurements that matter,' means improvisation must be part of our engagement with techno-cultural systems. IF my reader accepts that we are in synthetic ecological relationships, then engaging in relationships of stillness, of playful disruption, and non-cooperation will be part of our way of attending to and experimenting with worlds to come. Performers, building upon prior training, jam with one another in a combinatory space wherein possibilities emerge through the repetition of the various methods, knowledges, bodies, and materials in circulation. To keep the everyday performance of these systems in mind, we must "rehearse" for engagement through tinkering and troubleshooting, instead of treating the application layer as the primary interface for interaction. In my experience, performers regularly defer to technicians or engineers, looking for plug-and-play options to circumvent the room for error in production. Accepting this division means improvisation is closed off to human-computer "jams" which might seize, interrupt, scramble or otherwise hack contingent techno-cultural milieus so that something new may emerge. Glitches have emerged as cultural signifiers for the chaos and chance that complicate the order of all computational systems with contingency, or, "whatever is neither impossible nor necessary" (Krapp, 2011, 86). But smoothly operating media devices equal the determinacy of those that are buggy to the point of being bricked. Glitches mark a very material ecology of interaction, often experienced as a break in functionality. The intersections and material layers we must intervene upon are often spaces unseen and times unfelt.

Something Blue. This world we have built is one of sad repetition. We live through *seasons* of fires, hurricanes, floods and pandemics on a planet regularly convulsing with the sickness of the Anthropocene. A friend and scholar recently said to me that the world has already

ended; it is just taking a while for us to wake up to this fact in the West. This is not to wallow in despair, but to realize that affect is helpful for locating ourselves amidst socio-technological change. The pandemic in particular has highlighted this moment of cognitive or emotional dissonance, where students express both a sense of encroaching dread and despair alongside excitement for the new and the next. We must collide this bleakness of the future we have corrupted back into the past; those moments of innovation must be seen with the 'blue affects' of a present future where the skies are anything but blue. Not to repeat the tired trope of techno-determinism, but we need to challenge contemporary guarantors of the future with the evidence of so many past failures. Mourning can be dismissed, mocked, and even medicalized, but it remains powerful because it is in a sense inarguable. As a present embodiment of our techno-future, mourning lingers in eyes, hearts and minds as a resilient performance that is extra-discursive. Like so many technological rhythms, mourning both echoes across timescales and is felt here and now. This blueness reminds us that we frankly don't have time to believe saccharine dreams of techno salvation, or to fantasize about absconding to a different planet if we burn this one to reach escape velocity.

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