

Feminist Science Interventions in Self-Tracking Technology

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Abstract

Contemporary self-tracking systems signal a new era of biological monitoring now entangled with the politics of ubiquitous computing. Is self-tracking technology, which is connected to major stakeholders in healthcare, essential for filling in gaps in care, or is it fueling an increasingly commercialized medical industry? This essay examines the complex biases embedded in self-tracking technologies and introduces three manifestations of feminist science that subvert the monetization of personal health information: feminist art collective subRosa, which investigates how personal genetic information is developed into marketable medical products in their web-based project, *Cell Track: Mapping the Appropriation of Life Materials*; media artist and biohacker Mary Maggic, who makes self-synthesized hormone therapy accessible with their Open Source Estrogen project; artist-researcher Heather Dewey-Hagborg, whose biohacking products provide a DIY science in a world marred by genetic policing. Against the lure of connectivity, feminist science looks to circumvention as a method for understanding and disrupting the gendered and raced politics embedded in self-tracking technology. Tracing alternative techno-politics in these three new media projects, this essay reveals the necessity for artistic interventions in the contemporary healthcare landscape.

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Introduction

Incited by the Information Age, the virtues of quantification are imbued in nearly every human activity. This is especially true in the pursuit of self-knowledge and in efforts to decode the biological interior. Thanks to scientific advancement, we know more about the body today than ever before. But to know thyself is to subscribe to the principles of tracking, a fundamental feature of internal study evident in both early monitoring practices like calendar-based fertility planning and contemporary biometric technology embedded in virtually all mobile devices.¹ Beyond the promise of exposing the “black box” of the body, advanced self-tracking technologies reify a techno-scientific agenda bent on reproduction. Biological data is recoded as quantifiable bits, creating a feedback loop of information. While nothing has changed about the body as such, the advancement of prosthetic feedback loops has decreased the space between the body and the industries that profit from its capacity to reproduce. The preoccupation with reproduction is thus a preoccupation with the functions of the feminine body.

To the extent that contemporary self-tracking technologies are deeply invested in affirming gender as a technology in itself, such systems reinforce scientific ideologies embedded in medical practice. In addition to revealing the specific political conditions in today’s configuration of gender qua technology, my argument locates points of departure and means for exploit. To this end, I evidence alternative modes of knowing (and knowing thyself) that halt—and at times redirect—the seamless proximity between bodies and the systems that harvest biological data.

As Deborah Lupton emphasizes in her book *The Quantified Self*, what makes current trends in digital self-tracking products different from the age-old traditions of analog journaling is their real-time processing and storage of personal information within cloud computing infrastructure (2016, 10). A key feature of today’s internet, cloud computing stores and analyzes our online identities, transforming our movements and interactions into code. In the spirit of engaging with what Lupton calls “lively data,” this essay builds on the idea that our data directly influences our subjectivity as well as its profile by regulatory and corporate bodies. Inspired by Banu Subramaniam and Angela Willey’s use of the “traffic” metaphor to illustrate discursive movement between feminism and science, I take “lively data” to represent the discursive (and political) entanglement between the body’s production of information and the technologies that seek to quantify it (2017, 2). While contemporary self-tracking

tech markets its services to all smartphone users, I want to highlight the history of violence against feminine, non-white, and disabled bodies in scientific research. Following this thread, and in an effort to shift the means of control away from capital in the cloud, I suggest feminist science as a radical approach to understanding our bodies and the way they operate within today's digital economy.

At once a discursive formulation and a radical practice, feminist science situates "feminism as a site for theorizing and reconfiguring the very meaning of science" (Subramaniam and Willey 2017, 4). Its theoretical foundations acknowledge systemic gender, racial, and income inequalities in Western scientific practice that have all but magnified under the conditions of networked technology. As Subramaniam and Willey demonstrate in their introduction to "Feminism's Sciences," the application of feminist theory in science and technology studies (STS) reveals the legacy of a one-size-fits-all approach in biomedical research, wherein health diagnostics and solutions are "based on the experiences of elite white populations" (2017, 16). This essay adopts a similar method of intersectional analysis by foregrounding the politics of the medicalized body in the face of pervasive biotechnology and suggesting feminist art as a different mode of knowing. The three new media art projects examined below mobilize the tenets of feminist science by critically engaging with both medical and technological discourses while advancing new methods of care. This examination is meant to move such interdisciplinary projects beyond cultural critique and into the territory of political transformation.

The Social Body Politic

The discourse surrounding self-tracking technology includes disability studies and feminist scholarship as well as STS, critical race theory, and political economy. To demonstrate how these disparate disciplines interweave, I think it's helpful to center Rosemarie Garland-Thomson's term "normate," which designates "the constructed identity of those who, by way of bodily configurations and cultural capital they assume, can step into a position of authority and wield the power it grants them" (1997, 8). Definitions of normativity and sovereignty typically work in tandem; those whose bodies subscribe to the given norms are more likely to be regarded as self-governing. Errant bodies are subject to social, political, and economic marginalization. Garland-Thomson reminds us that the figure of the normate—the white, educated heterosexual male—is a rather limited representation of the general population. But even people who fit this profile are susceptible to illness. As the healthcare system becomes increasingly privatized,

the gap between patients and healthcare providers widens, and this is especially true for both the middle class and the working poor. Considering the \$8 million invested by digital health companies in 2018 “to bring new technology to the healthcare industry,” healthcare is linked to capital in the same way data is linked to capital (Farr 2019). This has profound implications when addressing the social impact of algorithmic technology, as cultural constructs of identity must be carefully examined alongside individual and collective fluctuations in health.

Recent self-tracking arguments reveal the politics of biomedicalization, or “the extension of medical or biological explanation for the way things are,” in contemporary culture (Neff and Nafus 2016, 19). Neff and Nafus note that “[it] is now hard to find corners of life that are not subject to biomedical interpretation, from moods and feelings to life success itself” (2016, 19–20). Through biomedicalization, self-tracking has become a primary medium to express and analyze selfhood. To track oneself is to know oneself, and it is in this sentiment that Lupton locates “the apotheosis of the neoliberal entrepreneurial citizen ideal” (2016, 52). We see the ultimate manifestation of this ideal in social media “influencers,” who monitor (and subsequently share) their fitness progress alongside the number of “likes” and followers they accumulate by marketing this form of selfhood. Average consumers in the digital health economy participate in lifestyle- and self-management with wearable technology. Under the pretense of self-care, these biometric products embody a technologized vision of health that Natasha Dow Schüll (2016) refers to as “data for life.” By constantly monitoring and directing our habits in real time, wearable tech quantifies the process of self-empowerment. Of course, the amount of money that can be invested in these products (and the amount time that can be invested in the process of self-improvement) typically corresponds to a person’s socioeconomic status. It isn’t surprising that lifestyle brands generally cater to the white and wealthy.

The idea that better health can be achieved through constant self-monitoring obfuscates more promising determinants of health and wellness, like comprehensive public health systems, access to nutritious food, and an overall emphasis on quality of life—all of which is decidedly unattainable for most Americans. In this way, the weaving of biomedical ideology and contemporary technologized self-improvement reminds us that certain bodies are valued over others. At the same time, wearable technology instantiates nuanced biopolitical control through “governance by micronudge,” raising the question of agency in contemporary self-improvement practices (Schüll 2016, 324). Beyond the seemingly innocuous digital reminders to make healthy choices, self-tracking

technology expands the possibility of widespread state surveillance. These complexities of globally networked technology are further discussed toward the end of this essay.

Self-tracking technology, as we can see, is imbued with a politics that recognizes a mutually beneficial relationship between private interests and a cultural emphasis on convenience and social currency. Health historian Lara Freidenfelds (2015) satirically illuminates this political agenda in wearable tech with her speculative health tracker, VULVALUV. Where other trackers miss the mark in gender-specific interests, VULVALUV takes personalization to the next level by promising real-time period prediction and a “Smart Waistband” that adjusts to accommodate menstrual bloating. In addition to these specialized functions, VULVALUV comes equipped with what we have now come to expect from tracking apps geared toward health and fitness: heart rate monitoring, sensors that remind us to get moving, and communication with our online networks, including Facebook. All of this tech seamlessly integrated in our underwear, all in the interest of building community and optimizing our health.

Notwithstanding the fact that some of these features are useful for family planning, Freidenfelds calls to attention the biological conservatism and reproductive futurism embedded in self-tracking products marketed to women. For example, VULVALUV offers a post-pregnancy fitness feature that prompts users to engage in hourly kegel exercises to “[encourage] a healthy pelvic floor” (Freidenfelds 2015). And while the app reminds women who aren’t planning to become pregnant to take precautionary measures during ovulation, the social dimension of the app caters to those who intend to conceive.² What is perhaps more concerning, as Freidenfelds brings to the fore, is the issue of equating data with capital. She ends her product proposal with impressive statistical evidence to support an even more impressive (albeit frightening) intention:

The market potential is enormous. Tens of millions of health trackers are sold each year. And VULVALUV will have exclusive access to some of the most valuable market data and customer connections out there: it will be able to target expectant parents even before they are actually expecting...Let’s put VULVALUV on every tush in the nation.

Inasmuch as “valuable market data” offers us increased connectivity and convenience, it also re-entrenches the gendered biases in consumer behavior which equate women’s bodies with supply chains. The techno-capitalist extraction of biological processes raises two contentions in relation to labor. The first is that

there exists an incommensurable tension between biology and labor, meaning one necessarily involves the other. The second sees all labor as feminine, as it operates passively below our threshold of perception. In the case of self-tracking devices, biological data is being constantly collected. Here, “lively data” describes the relationship between the body’s output and a company’s commercial success. VULVALUV’s imperative to privatize reproduction emphasizes these arguments in biolabor, as the fertility industry hinges on procreation. Freidenfelds underscores the ethical questions we must ask when the products marketed to women under the pretense of “self-care” also regard them as both labor reserves and information to be mined for the sake of market potential.

As a medical device designed to keep the heart beating, the wireless cloud-connected pacemaker embodies the intersection of digital health products and the digital economy. In her article, “My Pacemaker Is Tracking Me from Inside My Body,” Neta Alexander (2018) describes the complicated relationship with her wireless pacemaker. She writes, “the idea of a battery-equipped, internet-connected device living forever inside my chest both terrifies and fascinates me.” That the pacemaker is ubiquitous—that is, it is collecting and distributing data through the Internet of Things—raises questions of cybersecurity and privacy, as well as moral and legal rights. What makes monitoring biometric information threatening is the exposure to hacking. Running on proprietary code and constantly collecting data, cardiovascular devices communicate with unseeable agents (we might recall Stelarc’s *Ping Body* in similar human-computer interaction). Certainly, the feeling of one’s pulse being “monetized” also uncomfortably reminds us that care today is often linked to enterprise (Alexander 2018). Like self-tracking tech, the concern here lies in the lack of transparency and the potential for data breaches despite the promise of personalized healthcare. Evidence of several period tracker apps sharing users’ personal health information with Facebook reveals the digital health industry’s anti-democratic data-sharing practices (see Rajagopalan 2019). As healthcare becomes increasingly motivated by the private sector, the biopolitics embedded in self-tracking products position both corporate and state power against consumer interests.

Analyzing algorithmic power, Taina Bucher suggests that we think of software as possessing “[ways] of seeing and organizing the world” (2018, 9). We see Bucher’s notion of “programmed sociality” working in the social networking apps we use every day, from seemingly innocuous reminders to reach our daily fitness goals to friend recommendations and curated playlists. According to Bucher, we need a political framework for understanding how power operates in and through

algorithmic systems: “talking about algorithms implies asking questions about and when users are implicated in developing and maintaining algorithmic logics, as well as asking questions about governance, who owns the data, and to what extent is it put to use?” (13). Considering the quotidian redlining that takes place anytime someone reveals their personal data online, at what point does patient information become subject to private interests or regulatory bodies? (see Kitchen and Dodge 2011). While it may be unsurprising that smokers pay higher insurance rates, it is difficult to reconcile the fact that cigarettes, as well as other unhealthy products like fast food and sugary drinks, are marketed to people who are already at risk and discriminated against in the medical system. This is very much a linchpin of the capitalist infrastructure that continues to thrive at the expense of those who are predisposed to insufficient care. Beyond the problem of programmed sociality, algorithmic power has the potential to make certain bodies more visible than others—and it’s important to remember that the politics of invisibility depend greatly on social and political contexts. In other words, tracking biotechnologies complicate the already difficult positions that exist outside of the heterosexual white male phenotype.

Critical race scholarship has illuminated the complex biases embedded in new technology, specifically in big data analytics (see Noble 2018; Benjamin 2019b). While the digital health industry maintains its progressive intentions, health disparities remain in clinical care and in medical record systems. Kadija Ferryman and Robert A. Winn (2018) observe, “the increasing use of electronic health records in AI systems favors groups who have robust health data profiles, rather than those that have limited healthcare access, discontinuous care, and more spotty and incomplete records.” Both Ferryman and Winn propose policymakers, tech developers, and medical experts work together to address algorithmic biases. They also suggest that researchers working across these disciplines collect non-biological data, like environmental records, to better “understand how multiple factors cause or prevent” diseases (Ferryman and Winn 2018). Despite moves toward preventative care, adequate biomedical treatment of pain remains elusive, particularly for people of color. With big data tracking and analyzing online and offline movements, how can marginalized groups be seen as more than collections of biometric and consumer data? Can artistic intervention in algorithmic processing help to fill the gaps that medical and tech researchers leave behind?

The Role of the Artist-Researcher

Since the late 1990s, cyberfeminist art collective subRosa has critically engaged with the politics surrounding women's health and biotechnology. With a scalable installation and accompanying website (<http://cyberfeminism.net/cell-track/>), subRosa's *Cell Track: Mapping the Appropriation of Life Materials* (2004) is both a "manifesto for a post-genome world" and a space for experimental research. *Cell Track* takes aesthetic cues from early net art, which is recognized for its utopian qualities in contradistinction to today's commercialized internet. The site displays an outline of a human figure whose body is marked with pulsating hyperlinks. At first, these red clickable dots appear to represent multiple areas of inflammation. But behind the figure lies a backdrop of a nondescript landmass, suggesting that these points are inscribed with specific geographical information. This added layer of geopolitical nuance illustrates bodily colonization, which is made even more prominent by a floating hyperlink titled "New Frontiers."

"Mapping the appropriation of life materials," *Cell Track* reminds us that the metaphor we use to circumscribe nations extends to our own bodies. As we see from the myriad drop-down boxes, subRosa traces connections between gold rush migration and the medical pursuit of the "Gold Standard," exposing the settler mentality in the biotechnology industry. Stem cell research in particular underscores the colonial practices that are placed on the female body. Embryonic stem cells, responsible for the creation of Dolly the Sheep, are imbued with a mythology similar to precious metals. The harvesting of such cells depends on a woman's capacity to reproduce, furthering the metaphor of pillaged land.

Emulating the spirit of the early web, *Cell Track* emphasizes access by providing information regarding patents, lawsuits, and government involvement with private medical companies. As an online dossier dedicated to public knowledge and political transparency, *Cell Track* demonstrates the role of the feminist scientist while adding new meaning to the idea of tracking. To track a cell in this instance is to investigate how personal genetic information is developed into commercial medical products, drawing attention to the corporate ownership of life materials. Unlike commercial self-tracking technology, subRosa's project effectively reconstitutes lively data as a material over and against a profit motive, animating the feminist scientist's anti-capitalist subjectivity. Beyond the interest in publicizing what is typically obfuscated information, *Cell Track* highlights the distance between the body and the industries that commodify genetic material (subRosa 2004). We see evidence of this distance when we consider the exorbitant cost of prescription drugs. While products like insulin are created from

synthesized human DNA, pharmaceutical price gouging forces many diabetics to ration their medication.

As a primarily feminist initiative, subRosa's projects reveal the longstanding interest in controlling and monetizing women's bodies specifically, and how the ethos of eugenics is cloaked in the move toward genetic optimization. Throughout scientific history, medical efforts have been made to control both female biology and behavior, and we see these efforts continuing in practices of coerced sterilization (see Ko 2016). The other, more insidious side of the biotech industry that operates in and through the interest in advancing the public good can be found in stem cell research. In her book, *People's Science: Bodies and Rights on the Stem Cell Frontier*, sociologist Ruha Benjamin (2013) calls attention to the unequal exchange between egg donors and medical research companies. Considering the physical costs of egg extraction, the compensation that donors receive is arguably incommensurate with the medical advances fruited by their biolabor.

Benjamin reveals the complicated arguments for and against women's participation in the marketization of human tissue. Among these arguments, she parses questions that position labor against service and economic class against biological race. Through this interpretation, Benjamin advocates for "the inclusion of feminist concerns about stem cell research" (2013, 109). Similarly, *Cell Track* encourages a dialogue around what Benjamin refers to as "the commodification of women's eggs" (81). While self-tracking technology cannot be criticized for monetizing human tissue as such, feminist activism reminds us of the historical lens through which to examine medicine and its socio-political imperatives. Which is to say, we must consider the gendered and racialized visions of the technologies that purport to advance public health. Along these lines, Aimi Hamraie and Kelly Fritsch's "Crip Technoscience Manifesto" reminds us of the "widespread perception that access technologies are made for [disabled people] by non-disabled experts" (2019, 7). This narrative not only neglects the disability community's "own practices of remaking the material world," it also reproduces the violent binary that positions the norma-anatomical model over a multitude of identities (Hamraie and Fritsch 2019, 7).

Rejecting the heteronormative ideology of biomedical science, new media artists and activists are making room for endless organizations of the body. This dissent aligns with progressive healing practices that refute the one-size-fits-all approach to diagnostics. Unfortunately, the interest in patient-centered techniques does

not even begin to address the immense gender bias in chronic pain and illness treatment, despite the fact that 78 percent of autoimmune sufferers are women (Fairweather, Frisancho-Kiss, and Rose 2008, 600). Bypassing the bureaucracy of the neoliberal medical system, bioart seeks to diminish the biopower held by experts and institutional gatekeepers. Artist and self-described “hacktivist” Mary Maggic makes citizen science possible through performative instructions. Their website, complete with how-to manuals and videos, provides access to hormone therapy that is otherwise financially or legally inaccessible. The idea of self-tracking is once again returned to constituents as these biotechnological practices and possibilities are liberated from enterprise.

Maggic highlights the environmental implications in genomics and the social construction of the body, underscoring the points raised by Freidenfelds. Advocating for “freak science,” Maggic engages in the practice of biological decolonization while dismantling the idea of normativity altogether. Along these lines, Garland-Thomson reminds us that no one is impervious to environmental interaction. She writes, “[that] anyone can become disabled at any time makes disability more fluid, and perhaps more threatening, to those who identify themselves as normates than such seemingly more stable marginal identities as femaleness, blackness, or nondominant ethnic identities” (1997, 14). Similarly, Hamraie and Fritch note that “mainstream disability technoscience presumes disability as an individual experience of impairment rather than a collective political experience of world-building and dismantling” (2019, 12). Despite continued attempts to fashion a one-size-fits-all accessibility model, “crip technoscience” recognizes the disability community’s production of equitable design through maintenance and tinkering practices (Hamraie and Fritsch 2019, 8). The aims of Maggic’s “freak science” and Hamraie and Fritsch’s “crip technoscience” are distinct from those used in commercial biotech products. Here, lively data is generated through community building for the purpose of identity affirmation and a refusal of institutional and knowledge gatekeeping.

Yet the tension between marginal and normative identities is intensified when we consider the widespread reliance on pharmaceuticals. If the decades-long war on drugs and the current opioid crisis have revealed anything, it is the continued expression of the complicated definition of identity that hinges on the power structures of a given point in time. Foucault illuminated how disciplinary institutions like prisons and hospitals produce docile bodies. These structures of power are intimately entwined with race and class—it is no coincidence that users of crack cocaine have always been treated differently (by the media and by the law) from those who can score a Xanax prescription. Self-tracking technology

seems to fully embody a panoptic logic, but the key difference today is that methods for maintaining biopower now depend to some extent on the political economy of programmed sociality, further complicating the social construction of race and identity at large.

Assuming our data will at some point be used against us, how are we to manage the potential redlining of adequate care services? Maggic's project, "Open Source Estrogen, a Manifesto," aims to mobilize public knowledge of the mutagenic effects in environmental endocrine disruptors while suggesting a do-it-yourself approach to science. Similar to subRosa's *Cell Track*, Maggic's website (<https://maggic.ooo/>) practices early web aesthetics. A collage of text, images, hyperlinks, the website's digital landscape blends with the analog style and intention reminiscent of the self-published zines produced by early 1990s feminist punk movements. Reclaiming the biopolitical potential of the kitchen, Maggic's video "Housewives Making Drugs" refigures the domestic space as a circumvention of government and institutional control. Maggic admits that the prospect of self-administering self-synthesized hormones raises ethical questions. For instance, what frameworks are already regulating our bodies and how might an open source estrogen "recipe" disrupt the data supply chain? In this case, a turn toward self-synthesis is a turn away from the neoliberal agenda embedded in self-tracking technology. Erasing the traces of medical records, including prescriptions and insurance claims, do-it-yourself science allows for greater control over one's body.

In the interest of preserving body sovereignty, Maggic demonstrates how to extract and repurpose the estrogen "pollution" in our environment to decolonize the biopolitical regimes of gender and medicine. Noting how hormones have been deployed for the purpose of mass food and pharmaceutical production, Maggic (n.d.) writes, "present hormone therapies both pathologize bodies and at the same time prioritize access over others." Considering the widespread use of hormones for agricultural purposes, perhaps the major difference in Eve's apple from those available today is the addition of genetically modified organisms. The sexism inherently tied to religious tenets has been meticulously preserved by conservative politics, as we see the prevailing tendency to colonize feminine bodies in purportedly secular public health initiatives. For instance, the evangelical interest in overturning *Roe v. Wade*, bolstered by the Trump-Pence administration's proposed changes to Title X, prioritizes a faith-based construct of morality over a woman's right to choose.³ Maggic is aware of the complex interaction between biopolitics and identity, and that hormonal gatekeeping and

pollution affects all bodies. They realize that xenoestrogens (those that exist outside of the body) have at once participated in genotoxicity while expanding theoretical and methodological of the body, or what they call “molecular queering.” But movements in the direction of queer epistemology do not guarantee a shift in politics. Even if transpeople have access to hormonal treatment, they are still beholden to conventions embedded in the bureaucratic pharmaceutical industry. With our data shadows becoming increasingly difficult to shed, patients who rely on birth control and hormonal replacement therapy would do well to arm themselves with do-it-yourself science.

Taking media activism further, artist-researcher Heather Dewey-Hagborg provides the public the means to safeguard biological data from widespread surveillance tactics employed for both government and commercial use. Her biohacking guidebooks and speculative products suggest a do-it-yourself science in a world marred by genetic policing. For people who have always been oppressed by judicial forces or social norms, “biopunk” initiatives offer methods to circumvent tracking. In this way, Dewey-Hagborg’s open source manuals offer marginalized people the chance to go unreported by police, insurance companies, or biotechnologies that continue to shape normative expectations of the body.

Dewey-Hagborg’s Invisible project (<http://biogenfutur.es/>) offers genetic privacy supplies to “[protect] against new forms of biological surveillance.” As a two-step process, Erase sprays away 99.5% of DNA that is publicly exposed while Replace cloaks the remaining .5% with “DNA noise.” Showcasing a fully functional product, the Invisible website adopts tongue-in-cheek marketing language, but the scientific potential is self-legitimizing in the post-truth era. Dewey-Hagborg makes use of the obvious connections to dystopian science fiction in an accompanying video. Intercutting news segments and press releases, the video suggests a relationship between national security programs and personal genomics companies in the move toward genetic surveillance. The video then dips to black, unveiling a black-and-white recording of Dewey-Hagborg herself in a dark lab named “Biogenfutures Sector C.” The artist demonstrates how to use Invisible after drinking from a glass of wine before the clip dissolves into an immaculate image of the product; the blue-tinted glass vials bring to mind a futuristic dermatological treatment. This dramatic performance plays out longstanding questions of personhood, calling attention to the complex weaving of “real” and virtual subjectivities. Dewey-Hagborg questions both the lure of personalization afforded by algorithmic tech and the merit of the quantified self. Her provocation brings to the fore the ethics of traceability, specifically the power

dynamic between invisible agents of sight and those who are subject to pervasive tracking. At the same time, Invisible also reminds us that our data can effectively imprison us. Where the previous projects have helped demonstrate lively data in the context of selfhood and recuperation, Dewey-Hagborg's project intimates a relation between lively and decaying data in which vitality is contingent on anonymity.

In the age of biological surveillance, the desire to be invisible appears to complicate the desire to be seen. Furthered by the economy of the "like" and programmed sociality, the cultivation of the online persona has led to hypervisibility. With our digital traces being catalogued by the likes of Google and Facebook, it is difficult to estimate what user data remains private. The increasing interest in safeguarding genetic privacy is evidenced by the fact that "more than 60 percent of Americans with European ancestry can be identified through their DNA using open genetic genealogy databases, regardless of whether they've ever sent in a spit kit" (Molteni 2018). More worrisome is the potential for law enforcement to engage in practices of hacking and planting DNA. Even for people who are not at risk for being framed by the penal system, the age of surveillance warrants methods for the public to defend itself from state violence.

While fascist leadership has always targeted anti-government groups, the Hong Kong protests in 2019 demonstrate the extent to which facial recognition technology impacts the ability to engage in democratic forms of resistance. For those of us fortunate not to live under the conditions of Chinese surveillance, the prospect of data determining both our social credit and political freedom seems somewhat removed. However, it is worth acknowledging that in terms of state-wide surveillance, North America and China implement similar strategies. This has become increasingly obvious in light of recent protests against police brutality. Despite the added layer of anonymity that face coverings provide (in this case, the conditions of the pandemic are rather auspicious), law enforcement can still track protesters' movements through mobile phone data transmission (see Thompson and Warzel 2019). An upgrade to 5G infrastructure would likely push us further in the direction of digital governance, intensifying discriminatory and oppressive carceral technology. As Benjamin (2019a) reminds us, race and technology are co-shaped. The racial bias embedded in predictive policing reflects the longstanding practice of profiling young Black men in America. Moreover, the fact that Black people are more likely to be killed by police compared to any other ethnic group evidences the myth of technological neutrality (see Mapping Police Violence 2020). For people who are currently subject to extreme state violence or have

been historically oppressed by judicial forces, biopunk initiatives offer the flexibility to operate between states of invisibility and visibility. In this way, Dewey-Hagborg's Invisible might extend potential targets the chance to be seen as something other than persons of interest.

Global Effects of Networked Technology

Thinking globally, how is networked technology implicated in both genetic and economic determinism? Beyond mineral extraction and electronic waste, the convenience of network infrastructure impinges the quality of the natural environment as much as it maintains social boundaries. Armin Medosch (2016) makes the connection between media technologies and the rise of neoliberalism: "The use of high tech to create global supply chains and computerized electronic markets in so-called 'global cities'...weakened organized labor in the rich nations, while the new workers in the global South had no chance of obtaining the same level of income and rights" (2016, 366). On the social concerns emerging from networked infrastructure, media theorist Christiane Paul asks, "[what] exactly does ubiquity mean if large portions of the world remain disconnected from digital networks or are restricted by their governments in their use of these networks? How can we classify the impact of pervasive computing, which ranges from enhanced agency and participation to invasive tracking?" (2013, 399). The connectivity purported by ubiquitous computing presupposes political and ecological conditions in which users may circumvent their given statuses as poor, non-white, disabled, etc. Ubiquity, in the form of tracking technologies as well as face and speech recognition algorithms, maintains these boundaries of race, class, and ability by allowing biotechnologies to surveil those who have been historically positioned as suspect. At the same time, these technologies maintain unequal access to quality goods and services necessary in the maintenance of health. In other words, we cannot fail to notice the fact that people who live in poverty (disproportionately, those who fall into the minority category) have a shorter life expectancy despite the purported advancements made by pervasive technology.

Reading medical historian Mirko Grmek, Emily Martin notes, "the coupling of medicine and modern technology is implicated in making the epidemic possible" (1994, 131). In a recent article, Danya Glabau (2020) remarks, "digital-health tools today promise quick technological fixes for deep social problems but ultimately leave those problems untouched." What computational biology reaffirms is the human tendency to turn toward technology in an effort to cure humans of biological and environmental afflictions. These are typically worthwhile research aims in the grand scheme of modern medicine, and many patients benefit from

their subsequent implementation. In the case of genetically modified people, made possible by CRISPR technology, the interest in disease management becomes complicated when certain genes are edited and passed on to progeny. Without knowing for sure the ecological ramifications of altering the gene pool, we risk future epidemics related to this kind of disruption. Even more concerning, as Martin observes, a move toward genetic flexibility implies a move toward social Darwinism, wherein the elite maintain optimal financial and biological credit. The precursor for such a move is already at work in the form of a dating app that matches users' DNA with potential mates.⁴ The rationale is to eradicate the potential for passing on inherited diseases, which, from a sociological perspective aligns with eugenics. For people who have already sold their DNA to genetic testing companies for the purpose of learning ancestral heritage (which in itself leans toward eugenic ideology),⁵ the process of reversing the damage done by surveillance tech might involve the use of products like Dewey-Hagborg's Invisible.

Amidst the resurgence of eugenics, we are currently facing a global health crisis. According to the World Health Organization, the coronavirus (COVID-19) has claimed more than two million lives since it began to spread in early 2020.⁶ In addition to the widespread fear of contagion, which is intensifying already present racial tensions, the outbreak coincides with the worst market plunge since the 2008 financial crisis (Steckelberg and Liberto 2020). The relationship between the global economy and public health is becoming increasingly tenuous. With the United States leading the world in confirmed cases and deaths, and with access to affordable healthcare out of many Americans' reach, we are now witnessing the ramifications of the country's deficient social infrastructure. In addition to exposing the incompetence of the world's richest country, the current pandemic has magnified the effects of globalization, leading to international market volatility on an unprecedented scale. Centering this in the discourse of self-tracking technology, we might consider the consequences of valorizing the neoliberal agenda rather than focusing on the expansion of public infrastructure. In an article on logistics, Ingrid Burrington (2020) writes, "the pursuit of optimization, efficiency, and totality has become so commonplace—and framed as utterly necessary and natural—that it's perhaps no surprise that such optimization has been further internalized into the cultivation of self, making efficiency as much a personal journey as it is a market imperative." Over and against the interest in capital accumulation, self-tracking tech foresees the implementation of a new world order based on biometric surveillance. Benjamin Bratton (2020) has recently advocated for such measures in the fight against

COVID-19. Evidence of this intention is detectable in the recently abandoned initiatives proposed by Google and Facebook (both primarily advertising platforms) to track the spread of the virus (Toh 2020). While Bratton suggests a “more nuanced vocabulary” to describe this direction of government control, extreme approaches to public health have historically advanced social inequality. In theory and practice, surveillance always magnifies difference. Feminist science offers an alternative to both the current fiscally conservative healthcare model and one that would potentially involve the federal imposition of big data biopolitics.

Toward a “People’s Science”

In the age of surveillance capitalism, to know thyself comes at a cost. In other words, the “self” in self-tracking is part of a larger infrastructure of power that is all but invisible to us. Given the recent exposure of Project Nightingale, the secret transfer of millions of medical health records to Google, the implementation of federal measures for safeguarding confidential information seem futile. The average consumer might question the value in demanding more from our public officials, particularly when they seem to be motivated by the private sector. Such a value comes down to realizing that we are all users, patients, and subjects of data—even those of us whose material wealth can afford the most comprehensive health plan. But what happens when healthcare funding is cut for people who can’t buy their way in? The cracks in the precarious neoliberal healthcare system make a case for attending to matters of life and death, even if they are not our own. Accidents happen and people get sick. Very rarely is everyone we care about always prepared to cover exorbitant medical costs (see Sanger-Katz 2016), and, as we know, health and wealth is a reciprocal relation.

While self-tracking technology appears to optimize users’ health, these products and services are imbued with an interest in monetizing personal health information. Knowing that social biases are embedded in algorithms we use every day, the questionable motives behind self-tracking tech reveal the necessity for interventions in the contemporary healthcare landscape. Drawing upon what has recently been described as “real utopias” in sociology, Benjamin (2013) identifies the importance of “agents of change” in the ability to entirely re-imagine the current social contract in which we are engaged. Questioning the dissonance between the body’s capacity to evolve and the resistance to social transformation, she asks, “*If our bodies can regenerate, why do we perceive our body politic as so utterly fixed?*” (172). Benjamin’s vision begins with democratic design, in which participation emphasizes a consultative rather than consumer perspective (175). In

addition to this economic repositioning, Benjamin foregrounds power-sharing structures that incorporate knowledge outside of the ivory tower. The fields of medical and technological research, as well as the social sciences that apply much needed criticality to biotechnological innovations, have historically privileged elite thinking at the expense of the very people who make the market for innovation possible.

As we have seen, traditional scientific paradigms impose different agendas for different bodies. These agendas have been integrated into the design of digital self-tracking, reinforcing the exploitative conditions of capital accumulation and violent social hierarchies. Specifically, self-tracking is imbued with a market logic that operates through the reproduction of biological data. As this article has demonstrated, the emphasis on reproduction is inherently gendered; while all biological data is extractable, the monetization of life materials relies primarily on feminine biolabor. Feminist science resists this reproductive logic by instantiating a participatory model, encouraging para-institutional experimentation and nonconventional forms of learning. In the context of biomedicine, feminist science centers marginalized identities and aims to recuperate vestiges of care in medical practice. Although the social contract has yet to lean in the direction of a “real utopia,” feminist science evidences movements toward political liberation. Biopunk tactics and bioart hacktivism mobilize feminist manifestos, embodying the potential for non-normativity. These new methods of scientific practice critically examine—and in some cases offer a departure from—the neoliberal biotechnology industry.

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Notes

¹ The marketing of weight scales led to calorie-counting diet trends following the scientific discovery of the calorie in the late nineteenth century. The early twentieth century illuminated the phases of the female ovulation cycle, which led to both religious and secular advocacy for the rhythm method in fertility tracking.

² As part of Friendenfeld’s satirical project, VULVALUV users are encouraged to

share their pregnancy journey with their Facebook friends so that more data can be collected for the purpose of buying into the latest feature of the baby book, the “Conception Story.”

³ Presently, federal Title X funding provides access to affordable contraception and reproductive health care. While the program does not offer abortion, Title X law requires health care providers to inform patients how they may legally access abortion. The Trump administration proposed a nationwide “gag” rule designed to limit access to reproductive health care as well as referrals to safe, legal abortion services. See Planned Parenthood Action Fund, n.d.

⁴ A team of geneticists at Harvard Medical School are working on a selection system to optimize DNA compatibility in the hopes of “[transforming] human health.” See Pelly 2019.

⁵ I mean to suggest an argument that the ethos of genetic testing seems to favor white European heritage. Campaigns by companies like 23andMe have recently foregrounded genetic traits associated with photobleaching. See 23andMe, n.d.

⁶ As of January 25, 2021. See the World Health Organization’s Coronavirus (COVID-19) Dashboard: <https://covid19.who.int/>.

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