THE UNIVERSITY OF CHICAGO

# AFTER UBIQUITY:

# SURVEILLANCE MEDIA AND THE TECHNICS OF SOCIAL DIFFERENCE

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BY

GARY ALEXANDER KAFER

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## ABSTRACT

This dissertations interrogates how the concept of ubiquity has dominated understandings of surveillance technologies within contemporary American society and in its transnational reach. In its common use, ubiquity refers to the way that surveillance technologies are everywhere around us, while digital media scholars use the term to denote how sensing devices are universal in scope and experientially non-present. However, these frameworks are ill-equipped to examine how surveillance exercises differentiating violences within capital, colonial, and imperial power. Through a media studies approach, I argue instead that ubiquity is best understood as a *medial effect* produced through the technological and aesthetic operation of surveillance systems that indexes the uneven distribution of power across social and political life. Through a range of technical texts and aesthetic objects, I show how ubiquity obfuscates analytics of social difference at the same time that social difference serves as the ground upon which surveillance brings forth populations within racialized regimes of visibility and violence.

Each chapter focuses on a key site of mediation that is by nature ubiquitous, but does not produce equal effects of surveillance. The first chapter investigates how the use of weather data in predictive analytics reanimates colonialist imaginaries of race, affect, and the environment. The second chapter interrogates how genetic surveillance systems construct racial difference by predicting ancestry within DNA. The third chapter examines how radar technologies produce targets as racialized constructs within sites of US imperial war-making. The final chapter demonstrates how play is bound up with state-sanctioned racism and territorial violence within sites of border gamification. Ultimately, these chapters aim to transform how we understand the complicity of computational media within global circuits of differential power in order to contribute towards broader activist projects of resistance.

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# INTRODUCTION

## Ubiquity's Remainder

"Who we are to the ubiquitous machine, the ubiquitous connection,
is more significant than who we are to ourselves or to each other."
- David Lyon, *The Electronic Eye*[1]

Most apposite in flagging the widespread presence of remote sensing and tracking technologies, ubiquity offers a fairly common image of post-9/11 global mass surveillance. Anywhere one looks, one is sure to find some kind of surveillance device: CCTV cameras, smartphones, drones, airport security x-rays, predictive policing, biometric scanners, social network analysis, data mining, RFID tagging, microchips, automatic license plate readers, satellite imagery, cell site simulators, and so much more. Indeed, surveillance technologies are so embedded within the social milieu that we barely notice that they are there, lying in wait to capture data about our actions to be stored in some corporate or governmental database. In this sense, ubiquity calls attention to the way that our normative lifeworlds have become indelibly marked by the political scaffolding of surveillance through the proliferation of digital and networked technologies at all scales of existence. In order to participate in digital culture, one must acquiesce to tracking and sensing systems, abdicating some aspect of individual privacy in order to gain access to services and resources like telecommunications or healthcare. To be digital is thus to be surveilled. It is, writes surveillance scholar David Lyon, to give oneself over to that glorious "ubiquitous machine."

*After Ubiquity: Surveillance Media and the Technics of Social Difference* interrogates how ubiquity has dominated discourses on surveillance within twenty-first century American

[1] David Lyon, *The Electronic Eye: The Rise of Surveillance Society* (Minneapolis: University of Minnesota Press, 1994), 215.

society and across its transnational reach. In its common use, ubiquity most often refers to the way that surveillance technologies form an omnipresent background to everyday life—always on, always collecting data to be used for some future computation. Such a discursive framework has no doubt has proven useful for taking stock of the near universal presence of sensing and tracking technologies in everyday life. As surveillance studies scholar Gary Marx claims, "surveillance is ubiquitous, and its results are linked in networks of astounding complexity."[2] Indeed, among surveillance scholars, ubiquity is often taken for granted as a key definitional component of surveillance itself, such that what distinguishes surveillance from monitoring, tracking, and observation is the sheer universal scope that stretches across social and political contexts. As a banal feature of social life, surveillance "is a ubiquitous, routine, organizational practice, found in almost all institutions and potentially consequential in almost all life outcomes."[3] Surveillance thus is everywhere because, whether used for nefarious reasons or not, it is a key component of how humans engage in social activities, distribute resources, communicate, and prolong life. Digital technologies have only intensified the situation.

And yet, what might ubiquity conceal or obscure about the politics of surveillance? To be sure, while many among us might bemoan the encroachment onto personal privacy posed by smartphones and facial recognition systems, we often do so without acknowledging how such surveillance systems stand to benefit some of us and harm others. We might imagine surveillance to be widespread, but its effects are certainly are not universal and its appearance never equal. And even if we are all rendered as sources for data extraction by corporate and state actors, depending on how one is located among intersecting axes of marginalized identity, one can be

[2] Gary T. Marx, *Windows into the Soul: Surveillance and Society in an Age of High Technology* (Chicago: University of Chicago Press, 2016), 4.
[3] Sarah Brayne, "The Banality of Surveillance," *Surveillance & Society* 20.4 (2022): 376.

subject to a different litany of surveillance techniques within sites of education, medical care, labor, housing, and more. Indeed, for Black, brown, indigenous, poor, queer, trans, immigrant, disabled, and incarcerated people, surveillance is often a fact of daily life that produces differential experiences of visibility and violence.[4] We see as such, for example, in the school-to-prison pipeline wherein schools deploy zero-tolerance policies, police presence, and monitoring technologies to create pervasive networks of public and private surveillance for students—especially those who are low-income and racial and ethnic minorities, as well as those who are unsheltered and disabled.[5] Here, surveillance is felt keenly as an unavoidable presence within quotidian scenarios of education and family life that is contingent not upon the pervasiveness of digital technologies, but upon one's relative proximity to formations of raced, gendered, and class-based oppression.

How then might we attend to ubiquity without situating it as a necessary feature of surveillance or reducing it to the mere spread of digital and networked technology? Rather than start from the obviousness of ubiquity, might we instead encounter its contingent construction within social, cultural, and political milieus? And in doing so, what other technical and aesthetic forms might we cultivate to articulate the uneven distributions of power in surveillance culture?

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[4] For representative literature on the surveillance of various axes of sociopolitical difference, see: John Gilliom, *Overseers of the Poor: Surveillance, Resistance, and the Limits of Privacy* (Chicago: University of Chicago, 2001); Dean Spade, *Normal Life: Administrative Violence, Critical Trans Politics, and the Limits of Law* (Durham: Duke University Press, 2015); Rachel E. Dubrofsky and Shoshana Amielle Magnet (eds.), *Feminist Surveillance Studies* (Durham: Duke University Press, 2015); Reina Gossett, Eric A. Stanley and Johanna Burton (eds.), *Trap Door: Trans Cultural Production and the Politics of Visibility* (Cambridge: MIT Press, 2017); Andrew Crosby and Jeffrey Monaghan, *Policing Indigenous Movements: Dissent and the Security State* (Blackpoint, Nova Scotia: Fernwood Publishing, 2018); Saher Selod, *Forever Suspect: Racialized Surveillance of Muslim Americans in the War on Terror* (New Brunswick: Rutgers University Press, 2018); Toby Beauchamp, *Going Stealth: Transgender Politics and U.S. Surveillance Practices* (Durham: Duke University Press, 2019); Mia Fischer, *Terrorizing Gender: Transgender Visibility and the Surveillance Practices of the U.S. Security State* (Lincoln: University of Nebraska, 2019); Eric Stanley, *Atmospheres of Violence: Structuring Antagonism and the Trans/Queer Ungovernable* (Durham: Duke University Press, 2021.

[5] Catherine Y. Kim, Daniel J. Losen, and Damon T. Hewitt, *The School-to-Prison Pipeline: Structuring Legal Reform* (New York: NYU Press, 2012).

In this dissertation, I argue that rather than take for granted surveillance as a universal presence in digital culture, we might better understand ubiquity as a *medial effect* that indexes the uneven distribution of surveillance across social and political life. By medial effect, I mean that ubiquity emerges from the technological and aesthetic operation of surveillance systems and how they produce modes of being in relation to power. In this case, I demonstrate how surveillance technologies produce ubiquity effects by transforming any and all kinds of matter, bodies, and environments into an image of risk. And yet, key here is how ubiquity obfuscates analytics of social difference at the same time that social difference enables surveillance systems to track, sort, and classify populations. Stated differently, ubiquity is accomplished as a medial effect when social difference operates as a technics within surveillance technologies. To be clear, my claim is not simply that racial and gendered bias is hardwired into algorithmic systems (which it certainly is).[6] Rather, as both a cultural and technological construct, social difference serves as a condition of possibility for data to be made legible within existing epistemologies power. It is what enables surveillance technologies to demarcate boundaries between security and threat.

Ultimately, by calling attention to the "after" of ubiquity, my intention is not to suggest that ubiquitous surveillance has been accomplished. As much as digital capitalists might boast, there are still material and biological forms that are unscathed by computation and thus opaque to efforts for data collection. And even when surveillance is attributed to the proliferation of digital technologies, it remains uneven across social and cultural contexts. While overdeveloped nations are increasingly building environments for total sensing, like smart cities, such is not a worldwide standard as telecommunications bandwidth and internet usage are lagging across

[6] Joy Buolamwini and Timnit Gebru, "Gender Shades: Intersectional Accuracy Disparities in Commercial Gender Classification," Proceedings of Machine Learning Research 81 (2018): 1–15.

many previously colonized nations in what has been called the "digital divide."[7] Thus, following computer scientist Paul Dourish and cultural anthropologist Genevieve Bell, we might understand ubiquity not as our present reality, but as "a story of an as-yet-unattainable technological future," one that "is one firmly rooted in its own times."[8] In this sense, the "after" of this project's title signals not a sequential moment beyond ubiquity but instead an attunement to the ruins of ubiquity's future promise in the global North's present. It is my estimation that among these ruins are a dense assortment of technical and aesthetic forms that have gone relatively uninvestigated within the fervor for digital media's false pretense of universalism. By examining how ubiquity is leveraged in sites like big data, border security, warfare, and policing, I aim to uncover new conceptual language that can help us track the uneven distribution of surveillant power as felt by those most marginalized in society. If we cannot abandon the allure of ubiquity, we might instead turn towards its remainder.

*The Medial Effects of Ubiquity*

When surveillance is understood to be ubiquitous, the emphasis usually falls on its digital substrate and the ability for networked and sensing devices to monitor any and all activity in the physical world. Surveillance studies scholars, for example, evoke the term *ubiquitous surveillance* to signal "the prospect of a world in which it becomes increasingly difficult to escape the proliferating technologies for data collection, storage, and sorting."[9] Here, ubiquity emerges as a discursive property of surveillance, a way of talking about the proliferation of

[7] Benjamin Compaine (ed.), *Digital Divide: Facing a Crisis or Creating a Myth?* (Cambridge: MIT Press, 2001).
[8] Paul Dourish and Genevieve Bell, *Divining a Digital Future: Mess and Mythology in Ubiquitous Computing* (Cambridge: MIT Press, 2011), 20-21.
[9] Mark Andrejevic, "Ubiquitous surveillance," in *Routledge handbook of surveillance studies*, eds. Kirstie Ball, Kevin D. Hagerty, and David Lyon (Abingdon, United Kingdom: Routledge, 2012), 92.

interactive monitoring networks that aim to capture and aggregate populations of data in order to extend the reach of what Gilles Deleuze calls "control societies."[10] Such a framework in fact takes for granted that ubiquitous surveillance is by default contingent upon digital technologies insofar as it "requires knowledge of the location and identity of anything that is networked (devices, people, etc.) and for all of these to be addressable."[11] The result of this convergence between digital technologies and social monitoring is precisely the appearance of ubiquity as the modus operandi of surveillance. What makes surveillance ubiquitous is the impression that digital technologies are creating a society in which everyone is subject to monitoring regardless of their personal identity.

Such discursive fantasies of ubiquity now saturate popular notions of global mass surveillance within a post-Snowden world as state and corporate actors converge within transnational circuits of data collection and exchange. Companies like Meta capture data indiscriminately, targeting thoughts, feelings, ideas, and behaviors in order to make advertising easier and capital gain more efficient. Platforms like Amazon and Alibaba have transformed global economies of labor and product distribution through vast networks of logistical systems. State governments everywhere have ramped up border security initiatives that aggregate biometrics, social media data, and consumer behavior in order to detect risky forms of movement. And technologies like drones that were once confined to specific practices of military and police reconnaissance have now become mundane consumer technologies. What makes surveillance seem ubiquitous here is the feeling that new systems of data-based and algorithmic technologies can put everyone and everything under watch.

[10] Gilles Deleuze, "Postscript on the Societies of Control," *October* 59 (1992): 3-7.
[11] Torin Monahan and David Murakami Wood, "Ubiquitous Surveillance," in *Surveillance Studies: A Reader*, eds. T. Monahan and D. Murakami Wood (New York: Oxford University Press, 2018), 240.

And yet, within surveillance studies, the ubiquity of surveillance wasn't always so obviously an outcome of digital technologies. In fact, the coalescence of language around surveillance as ubiquitous emerged in an earlier moment to describe the pervasive forms of monitoring that comprise modern regimes of governance. Following from Foucauldian theories of disciplinary power, early scholarship from David Lyon and Oscar Gandy located surveillance as the inevitable product of the state and its bureaucratic techniques for identifying citizens, controlling labor and resources, and centralizing information.[12] Lyon notes for example that "surveillance is a central feature of modernity" insofar as it was needed for state and private actors to document the lives of its citizens and impose new forms of order.[13] As new sensing devices and networked systems were beginning to transform society in the latter decades of the twentieth century, such long-standing dynamics of surveillance were intensified, reanimating concerns about civil liberties that fomented within the legal apparatus of the modern state. Citing a range of electronic devices used by the police (breath analyzers, CCTV, and electronic anklets), Gary Marx warned in the late 1980s that surveillance has produced a "maximum security society," wherein "everyone is treated as a suspect" through novel covert intelligence gathering projects.[14] At work here is the notion that surveillance has become more profuse not only because digital technologies enable novel modes of data collection, but also because modern institutions for bureaucratic order, like the prison, have now emerged as dominant diagrams for organizing the social through involuntary means of information gathering.

Of course, this doesn't mean that surveillance is necessarily ubiquitous. There is a difference between ubiquity and universality—and indeed surveillance does not have to be

[12] Lyon, *The Electronic Eye*; Oscar Gandy, *The Panoptic Sort: A Political Economy of Personal Information* (Boulder, CO: Westview Press, 1993).
[13] Lyon, *The Electronic Eye*, 33.
[14] Gary T. Marx, *Undercover: Police in America* (Berkeley: University of California Press, 1988), 205.

universal in order for it to imagined as ubiquitous. While universality calls attention to how surveillance has become more common due to the proliferation of devices capable of data collection, ubiquity registers the *potential* for surveillance to be totalizing. The distance between these terms is enumerated in James Rule's 1974 study *Private Lives and Public Surveillance* in the concept of "surveillance capacity," which refers to the effectiveness of certain kinds of technologies to achieve the dystopic vision of Orwellian totalitarian surveillance.[15] However, as Rule notes, due to a number of technological constraints that limit the amount of information that can be stored, the speed of transmission between devices, and the size of the network, such a future is still a matter of fiction—even today. What this suggests is that ubiquity must be understood not as an outcome of certain infrastructural or technological elements, but rather as a cultural imaginary that shapes public perceptions of surveillance even before the infrastructure for it is in place.

And yet, for all the ways global mass surveillance in the twenty-first century can be understood as ubiquitous (whether or not surveillance is actually universal), such developments in digital ubiquity are in fact predicated upon a much longer history of industrial mass mediation that produced feelings of ubiquity through novels techniques of spatiotemporal compression. In other words, ubiquity is not just a discursive effect, but also a medial effect. Here then a brief history of ubiquity's relationship to media studies is necessary. Deriving from the Latin *ubique*, ubiquity was used as early as the sixteenth century to refer to a Lutheran sect, called the Ubiquitarians, who believed that the body of Christ is to be found in all places and things, not only in the Eucharist. Not long after, "ubiquitarian" became a commonplace word to describe, in a more secular sense, the state of being everywhere and was used across domains of warfare,

[15] James Rule, *Private Lives and Public Surveillance* (London: Allen Lane, 1973), 37-40.

commerce, and the law.[16] However, by the nineteenth century, ubiquity became a key aesthetic form to conceptualize novel developments in industrial mass media. As art historians Jacob Lewis and Kyle Parry observe, ubiquity emerged as a dominant motif among critics and theorists in the nineteenth century to tie "the photographic image with a pervasive conquest of the world."[17]

Photography became wedded to the concept of ubiquity in several senses. On the one hand, it revealed the pervasiveness of electromagnetic radiation that could be exploited for an infinite array of applications in the sciences and art. In addition, notwithstanding the cost of production and access to resources, photographic technologies like the handheld Brownie camera from Eastman Kodak released in 1900 lowered the bar for amateur practitioners to produce images with little training and practice, thus inaugurating "the first revolution in photographic ubiquity" wherein the camera became a plaything of the masses.[18] Most importantly, photography was a key surveillance technology of the modern state to collect and circulate data through colonial trade networks. Photography was used, for example, by American and European police to document criminal populations as well as by states like South Africa and Australia to create identification systems that could assist tracking East Asian and South Asian migrants within penal colonies.[19] What made photography ubiquitous then is how it enabled

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[16] For a brief cultural history of the term "ubiquity" see Jacob W. Lewis and Kyle Parry, "Introduction: Ubiquity Has a History," in *Ubiquity: Photography's Multitudes*, ed. Jacob W. Lewis and Kyle Parry (Leuven, Belgium: Leuven University Press, 2022), 15.

[17] Lewis and Parry, "Introduction," 15; 9.

[18] Kris Belden-Adams, "Locating the Selfie within Photography's History—and Beyond," in Exploring the Selfie: Historical, Theoretical, and Analytic Approaches to Digital Self-Photography, eds. Julia Eckel, Jens Ruchatz, and Sabine Wirth (Cham: Palgrave Macmillan, 2018), 92. Curiously here in the history of photography, the ubiquity of recording technology first staged public anxieties about threats to privacy that have remained within contemporary debates about digital surveillance. As Robert Mensel documents, the first legal discourse on "the rights to privacy" in the United States appeared in response to amateur photographers taking snapshots of strangers in public without consent. See Robert E. Mensel, "'Kodakers Lying in Wait': Amateur Photography and the Right to Privacy in New York, 1885-1915," *American Quarterly* 43.1 (1991): 24-45.

[19] Joshua Reeves, "Police Media: The Governance of Territory, Speed, and Communication," *Communication and Critical/Cultural Studies* 10.4 (2013): 359-384; Uma Dhupelia-Mesthrie and Margaret Allen, "Controlling

novel contractions of space and time within the modern imaginary. As cameras populated the globe, anything and anyone could be made to appear anywhere for any purpose—the world itself as image.

What's important about this history is how ubiquity becomes contingent upon the technical and aesthetic affordances of reproductive mechanical media like photography and film. In a 1928 essay titled "The Conquest of Ubiquity," French critic Paul Valéry speculates that what was already achieved for recorded sound might also one day be accomplished for the visual arts. Just as the phonograph allowed one to record and playback music anywhere and at any time regardless of its origin, Valéry considers how "works of art will acquire a kind of ubiquity" when it becomes "possible to send anywhere or to recreate anywhere a system of sensations, or more precisely a system of stimuli, provoked by some object or event in any given place."[20] Here Valéry outlines a possible future in which one would be able to instantly summon works of art "either in their living actuality or restored from the past" just as one is able to bring in utilities like gas and water into the home from a far off place.[21] Ubiquity thus is both enabled by and contingent upon developments in networked telecommunication infrastructure. As Lewis and Parry observe, "for Valéry, ubiquitous photography, as well as the cognates of cinema and recorded sound, were always to be experienced via the electrified, networked, and thus *tethered* apparatuses of modern space-time.[22] To be sure, similar observations were made by media theorists like Walter Benjamin, Siegfried Kracauer, and Dziga Vertov across the twentieth

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Transnational Asian Mobilities: A Comparison of Documentary Systems in Australia and South Africa, 1890s to 1940s," *Making Surveillance States: Transnational Histories*, ed. Robert Heynen and Emily van der Muelen (Toronto: University of Toronto Press.), 133–162.

[20] Paul Valéry, "The Conquest of Ubiquity," in *Aesthetics: Collected Works*, trans. Ralph Mannheim, vol. 13 (New York: Pantheon, 1964), 225.
[21] Paul Valéry, "The Conquest of Ubiquity," 225.
[22] Lewis and Parry, "Introduction," 13; emphasis in the original.

century, all of whom took stock of photography's ability to remove objects from their original contexts in order to be freely circulated anywhere as images.[23] While writing from various locales and with different political projects in mind, consistent across these accounts is how ubiquity is not simply a description of the sheer magnitude of images or the prevalence of technology, but rather becomes thinkable in the first place as an effect of mediation that allows one total access to the world.

Following from such developments in mass mediation, the advent of digital and networked media has caused a shift in cultural imaginaries of ubiquity. If ubiquity in late nineteenth and twentieth century histories of the photographic image entailed a mediated integration of human and machinic perception, in contemporary digital culture ubiquity refers less to the ability to see everything, than for everything to be connected. In many respects, such a framework for ubiquity finds its precedent in developments of ubiquitous computing in the latter part of the twentieth century following decades of cybernetics research in feedback and control mechanisms.[24] First described by Mark Weiser, head of the Computer Science Laboratory at the Xerox Palo Alto Research Center, in a 1991 article published in *Scientific American*, ubiquitous computing refers to the seamless integration of computational technologies within the everyday lifeworld. The most powerful advancements in computers, he argues, are not only those that introduce multimedia capabilities or enable enhanced portability. The goal rather is to make computational technologies "fade into the background."[25] Also referred to as "embodied

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[23] Walter Benjamin, "The Work of Art in the Age of Mechanical Reproduction," in *Illuminations*, trans. Harry Zohn (New York: Schocken Books, 1968); Siegfried Kracauer, "Photography," trans. Thomas Levin, *Critical Inquiry* 19.3 (1993): 421-436; Dziga Vertov, *Kino-Eye: The Writings of Dziga Vertov*, trans. Kevin O'Brien (Berkeley: University of California Press, 1984).

[24] Orit Halpern, *Beautiful Data: A History of Vision and Reason since 1945* (Durham: Duke University Press, 2015).

[25] Mark Weiser, "The Computer for the 21st Century," *Scientific American* (1991): 94. Weiser further elaborates on this notion of ubiquity in his co-authored writing on "calm computing" with John Seely Brown, Chief Scientist of Xerox and director of the Palo Alto Center. Calm computing is achieved when computation is so deeply engrained in the fabric of the social world that it does not actively disturb one's actions or thoughts. As they write, "if

virtuality," ubiquitous computing is imagined to facilitate more efficient forms of labor and superior social relations since the withdrawal of computing from attention allows users to focus on the task at hand or the person on the other end of the link. By becoming seamlessly integrated into every aspect of social life, computation thus recedes from view, a barely noticeable environment for work, play, and leisure. More recently, this view of ubiquitous computing has become palpable in the Internet of Things and related concepts of ambient computing, pervasive computing, cloud computing, and everyware.[26]

What is crucial about Weiser's framework is how ubiquity is defined both quantitatively and qualitatively as an effect of mediation. It describes both the situation in which computation is at once physically everywhere (woven into objects, bodies, and places) but experientially nowhere (outside the bounds of everyday perception). As Dourish and Bell remark in their reading of Weiser, "ubiquitous computing was, from the outset, a proposal not how technology should *be* but instead how it should be *experienced*."[27] Taking into account both ubiquity's technological and aesthetic dimensions, we thus can formulate a *ubiquity thesis* for digital technology: to be ubiquitous is to be both universal and non-present.

Digital media scholarship has variously reiterated these two fundamental axes in order to understand how computational and networked media shape contemporary digital cultures. On the one hand, universalism refers to the brute technological presence of sensors across every facet of life. Such an approach has been useful for tracking how computational media form sociotechnical ensembles that support the distribution of data across vast distances, including for

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computers are everywhere, they had better stay out of the way, and that means designing them so that the people being shared by the computers remain serene and in control." Mark Weiser and John Seely Brown, "The Coming Age of Calm Computing," in *Beyond Calculation: The Next Fifty Years of Computing*, ed. P. J. Denning et al. (New York: Springer Science + Business Media, 1997), 79.

[26] Adam Greenfield, *Everyware: The Dawning Age of Ubiquitous Computing* (Boston: New Riders, 2006).

[27] Dourish and Bell, *Divining a Digital Future*, 116.

instance fiber-optic cables, satellites, data centers, RFID chips, mobile phones, and logistical networks.[28] In this case, surveillance is not only a form of social organization, but also a material reality constructed and maintained across "techno-geographies" that are at once environmental, networked, and automated.[29] On the other hand, non-presence brackets how digital technologies retreat from view as a background or environmental surround, unnoticed within the bounds of everyday perception. Scholars like Mark Hansen, Malcom McCullough, and Paul Roquet have tracked out computation has become operative within ubiquitous sensing environments that operate below the threshold of human experience, in turn imperceptibly impacting sensory experience to drive human behavior.[30] For surveillance to be ubiquitous in this respect would entail operating as an atmospheric condition that pervades social life through which diffuse forms of networked computation collect and model data without human awareness.

Taken together, the ubiquity thesis describes the situation in which a vast array of networked real-time sensors become integrated in the material world, processing data and forming predictions beyond the limits of human consciousness. At stake here is a continuation and transformation of how ubiquity emerges as an effect of mediation in digital surveillance systems. If photography previously revealed ubiquity as the result of space-time compressions

[28] Following the Snowden leaks of 2013, there was a critical mass of artwork and scholarship on the materiality of the Internet and its potential for surveillance. A range of artworks here include James Bridle's *How to See Through the Cloud* (2013), Matt Parker's *The People's Cloud* (2016), Sean Snyder's *Cloud Sediment* (2016), and Trevor Paglen and Jacob Appelbaum's *Autonomy Cube* (2014-present). Infrastructure studies too has turned focus to the hardware and physical sites of the Internet, including Nicole Starosielski and Lisa Parks (eds.), *Signal Traffic: Critical Studies of Media Infrastructures* (Urbana: University of Illinois Press, 2015).; Tung-Hui Hu, *A Prehistory of the Cloud* (Cambridge: MIT Press, 2015); Nicole Starosielski, *The Undersea Network* (Durham: Duke University Press, 2015).

[29] Jennifer Gabrys, *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet* (Minneapolis: University of Minnesota Press, 2016), 4.

[30] Mark Hansen, "Ubiquitous Sensation: Toward an Atmospheric, Collective, and Microtemporal Model of Media," in *Throughout: Art and Culture Emerging with Ubiquitous Computing*, ed. Ulrik Ekman (Cambridge: MIT Press, 2013); Malcolm McCullough, *Ambient Commons: Attention in the Age of Embodied Information* (Cambridge: MIT Press, 2015); Paul Roquet, *Ambient Media: Japanese Atmospheres of Self* (Minneapolis: University of Minnesota Press, 2016).

that enabled the human total access to the world, digital technologies bear witness to an experience of ubiquity as one of "technocultural augmentation" in which computation decouples ubiquity from the human subject.[31] This means not only that data can be seemingly extracted from anything and distributed anywhere, but also that digital technologies widen the perceptual limits though which the world becomes connected and knowable. As James Hodge writes, within contemporary digital culture, ubiquity has transformed from "all-seeing to all-sensing."[32] Key here is how digital ubiquity exceeds visual correlates with human perception, instead operating through non-representational flows of data that traffic only between machines.[33] And even when such technologies produce images, such images are "machine-readable": they appear for humans only briefly and under specific circumstances, like a satellite image produced from layered arrays of geospatial data that only apprehend a visual scene by happenstance.[34] Ultimately, then, to understand digital surveillance as ubiquitous entails a recognition of the immeasurable scale of machinic perception that in many ways remains recalcitrant to human frameworks of sensemaking if not as one of mediation itself. Throughout, ubiquity secures the epistemic boundaries upon which digital technologies gain their force as medial agents for organizing social, political, and economic power.

*The Trouble of Surveillance*

However, beyond the way that the ubiquity thesis has animated media studies over the past several decades, there remains a central issue once applied to the politics of surveillance. As

[31] Ulrik Ekman, "Introduction," in *Throughout: Art and Culture Emerging with Ubiquitous Computing*, ed. U. Ekman (Cambridge: MIT Press, 2013), 17.
[32] James Hodge, "Gifts of Ubiquity," *Film Criticism* 39.2 (2014-15): 64.
[33] Shane Denson, *Discorrelated Images* (Durham: Duke University Press, 2020).
[34] Trevor Paglen, "Invisible Images: Your Pictures Are Looking At You," *The New Inquiry*, December 8, 2016, https://thenewinquiry.com/invisible-images-your-pictures-are-looking-at-you.

more recent surveillance studies scholarship has demonstrated, ubiquitous surveillance is not all that new, but is instead "a historically *situated* phenomenon" that produces differentiating violences within regimes of racial capitalism, imperialism, and settler colonialism.[35] In her groundbreaking book *Dark Matters*, Simone Browne tracks how contemporary surveillance systems like biometrics find their antecedent in histories of colonial violence and chattel slavery. In doing so, she argues that we should not see surveillance as something "inaugurated by new technologies" but as part of ongoing historical projects of power in which "racism and antiblackness undergird and sustain the intersecting surveillance of the present order."[36] Similarly, Robert Heynen and Emily van der Meulen argue that histories of surveillance "are inextricable from broader histories of colonialism and imperialism, and the global movement of goods, people, diseases, ideas, and technologies."[37] Such research has made apparent how surveillance in the first instance must be understood as a technique of capital, colonial, and imperial power, and how the primary goal of surveillance (digital or not) is to perpetuate differences among populations within racialized hierarchies of threat.[38] No doubt, these histories of surveillance underscore contemporary issues of discrimination and bias within big data systems in which populations are categorized and sorted through proxies that encode for

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[35] Andreas Marklund and Laura Skouvig, "Introduction: Histories of surveillance from antiquity to the digital era," in *Histories of Surveillance From Antiquity to the Digital Era: The Eyes and Ears of Power*, ed. Andreas Marklund and Laura Skouvig (London, New York: Routledge, 2022), 2; emphasis original. Relatedly, Toni Weller argues that "surveillance is historically ubiquitous" insofar as surveillance seems to be a constant variable across social, cultural, and historical contexts, not just in the modern industrial era or in digital control societies. Toni Weller, "The Historical Ubiquity of Surveillance," in *Histories of Surveillance from Antiquity to the Digital Era: The Eyes and Ears of Power*, eds. Andreas Marklund and Laura Skouvig (London and New York: Routledge Press, 2022), 163.

[36] Simone Browne, *Dark Matters: On the Surveillance of Blackness* (Durham: Duke University Press, 2015), 8-9.

[37] Robert Heynen and Emily van der Meulen, *Making Surveillance States: Transnational Histories* (Toronto: University of Toronto Press, 2019), 4.

[38] As Torin Monahan defines it, surveillance is "hegemonic in that it can appear rational and reasonable even while it reproduces undemocratic and discriminatory social orders shot through with gender, racial, class, and other inequalities." Torin Monahan, *Crisis Vision: Race and the Cultural Production of Surveillance* (Durham: Duke University Press, 2022), 6.

sociopolitical difference.[39] And as Paul Dourish and Scott Mainwaring suggest, ubiquitous computing itself is indelibly entwined within the economic and epistemological enterprise of colonialism insofar as it promotes a universalist worldview of data capture that naturalizes historical patterns of power within state and commercial interests.[40]

Moreover, the ubiquity thesis risks effacing the uneven geopolitical processes of domination that would make surveillance appear as ubiquitous in different ways within different parts of the world.[41] To be sure, such distributions of surveillance reflect historical legacies of colonialism, imperialism, and apartheid through which nations in the global North—including North American countries like the U.S and Canada, the European Union, Israel, Australia and New Zealand, Russia, the Gulf Cooperation Council countries like the United Arab Emirates and Saudi Arabia, and East Asian countries like China, Japan, and South Korea— have long exerted domination over those in the global South. Within the field of big data studies, concepts such as "data colonialism" signpost how corporations and governments have built massive transnational infrastructures for data extraction and profiteering.[42] Take for instance China, the emergent global leader in artificial intelligence which now supplies surveillance technologies produced by

[39] See, for example: dana boyd, Karen Levy, and Alice Marwick, "The Networked Nature of Algorithmic Discrimination," Open Technology Institute, 2014, http://www.danah.org/papers/2014/DataDiscrimination.pdf; Cathy O'Neil, *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy* (New York: Crown, 2016); Solon Barocas and Andrew Selbst, "Big Data's Disparate Impact," *California Law Review* 104.671 (2016): 671-732; John Cheney-Lippold, *We Are Data: Algorithms and the Making of Our Digital Selves* (New York: NYU Press, 2017); Safiya Noble, *Algorithms of Oppression: How Search Engines Reinforce Racism* (New York: NYU Press, 2018); Virginia Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (New York: St. Martin's Press, 2017); Ruha Benjamin, *Race After Technology: Abolitionist Tools for the New Jim Code* (Medford, MA: Polity Press, 2019).

[40] Paul Dourish and Scott Mainwaring, "Ubicomp's colonial impulse," *Proceedings of the 2012 ACM Conference on Ubiquitous Computing* (2012): 134; 135.

[41] Matthew Fuller refers to the global difference in digital technology as an inequity in "ubiquity distributions." Matthew Fuller, "Foreword," in *Throughout: Art and Culture Emerging with Ubiquitous Computing*, ed. Ulrik Ekman (Cambridge: MIT Press, 2013), ix. For a critique of the uneven distribution of ubiquitous computing, see also Rob Kitchin and Martin Dodge, *Code/Space: Software and Everyday Life* (Cambridge: MIT Press, 2011).

[42] Nick Couldry and Ulises A. Mejias, "Data Colonialism: Rethinking Big Data's Relation to the Contemporary Subject," *Television & New Media* 20.4 (2019): 336–49.

corporations like Huawei, Hikvision, Dahua, and ZTE to over sixty countries worldwide.[43] Notably, many of these countries have signed onto China's Digital Silk Road (DSR) project as part of its wider Belt and Road Initiative, a massive infrastructure development strategy intended to increase China's global trade of artificial intelligence and cloud computing technologies, especially in Africa, Southeast Asia, and Oceania. Promising a future of global connectivity, the DSR aims to implement a planetary-scale digital surveillance network that "frames the environment, including sovereign territories, peoples, and natural resources, as data assets," in turn exacerbating practices of localized colonial surveillance such as the internment of religious and ethnic minorities including Uyghurs and Tibetan Muslims.[44] Importantly, it should be noted that global systems of surveillance are not unidirectional relations of domination and coercion where the South is simply an external victim to the North. Rather, as evidenced by a range of security regimes in nations like Brazil, Egypt, India, and Jamaica, the South too is characterized by conflicting and overlapping transnational geographies of empire, "each with their own universalizing imaginaries."[45]

Taken together, at issue here is how the global material realities of capital, colonial, and imperial domination put pressure on the relationship of surveillance and ubiquity. As these geopolitical distributions of surveillance suggests, it is impossible to locate a time when surveillance became ubiquitous since it has always held the potential for achieving a totalizing

[43] Steven Feldstein, "The Global Expansion of AI Surveillance," Carnegie Endowment for National Peace, September 2019, https://carnegieendowment.org/2019/09/17/global-expansion-of-ai-surveillance-pub-79847.
[44] Shaoling Ma, "Big Earths of China: Remotely Sensing Xinjiang along the Belt and Road," *Critical Inquiry* 49.1 (2022): 80.
[45] Samar Al-Bulushi, Sahana Ghosh, and Inderpal Grewal, "Security from the South: Postcolonial and Imperial Entanglements," *Social Text* 152, 40.3 (2022): 5. See Paul Amar, *The Security Archipelago: Human Security States, Sexuality Politics, and the End of Neoliberalism* (Durham, NC: Duke University Press, 2013); [45] Sahana Ghosh, "Domestic Affairs: National Security and the Politics of Protest at India's 'Friendly' Borderlands," *Social Text* 152, 40.3 (2022): 61-82; Deborah Thomas, "Can Black Lives Matter in a Black Country?," *Social Text* 40.3 (2022): 17-35.

matrix of power for different people at different points in time. What surveillance politics thus brings into focus here is how ubiquity's medial effects are less a matter of how much computation as infiltrated ordinary lifeworlds and more so an issue of one's proximity to surveillance as a dominant diagram for organizing the social within broader formations of what Nicholas Mirzoeff calls "racial surveillance capitalism."[46] To this end, I argue that the emergence of a new discourse on ubiquitous surveillance in the twenty-first century, especially within the United States, coincides with a more general redistribution of the medial effects of digital technology to construct racialized security architectures for policing the global social order. To name surveillance as ubiquitous is to locate surveillance as a unique problem for thought and an object of anxiety for white civil society.

To witness the racial contours at stake in ubiquitous surveillance within the United States, consider this cartoon created by Mike Keefe which appeared in *The Denver Post* on October 7, 2010 (Fig. 0.1). In it, a white suburban couple sits in a glass house surrounded by a dizzying panoply of surveillance technologies, including cameras, microphones, and satellites—the largest of which is labeled with the text "expanded surveillance powers." Says the man to the woman: "When the president promised more transparency, I thought he was talking about our government."[47] Published three years before Edward Snowden leaked classified material revealing the global extent of telecommunications surveillance performed by the National Security Administration (NSA), the cartoon lampoons the flagrant increase of post-9/11 federal authority to surveil its citizens by suggesting that the overabundance of surveillance devices has

[46] Nicholas Mirzoeff, "Artificial vision, white space and racial surveillance capitalism," *AI & Society* 36 (2021): 1295-1305.

[47] The invocation of transparency here is perhaps a reference to a 2009 presidential memorandum that called for an "open government" in which federal agencies would "harness new technologies to put information about their operations and decisions online and readily available to the public." The White House, "Transparency and Open Government," January 21, 2009, https://obamawhitehouse.archives.gov/the-press-office/transparency-and-open-government.

rendered private life more public. Just over a week prior, *The New York Times* broke the story that the government was seeking to establish so-called "back door" provisions that would permit the federal agencies like the NSA to intercept communications like email and messages on third-party platforms like Facebook without an explicit mandate.[48] And several months before that, the Obama administration extended a number of provisions in the PATRIOT Act that were set to expire, including the ability for federal agencies to wiretap phones without probable cause, as well as to seize records and property in counterinsurgency operations. Such legislative actions form the core of contemporary moral panics about how the onslaught of surveillance technologies have ineluctably eroded civil liberties like the right to privacy.

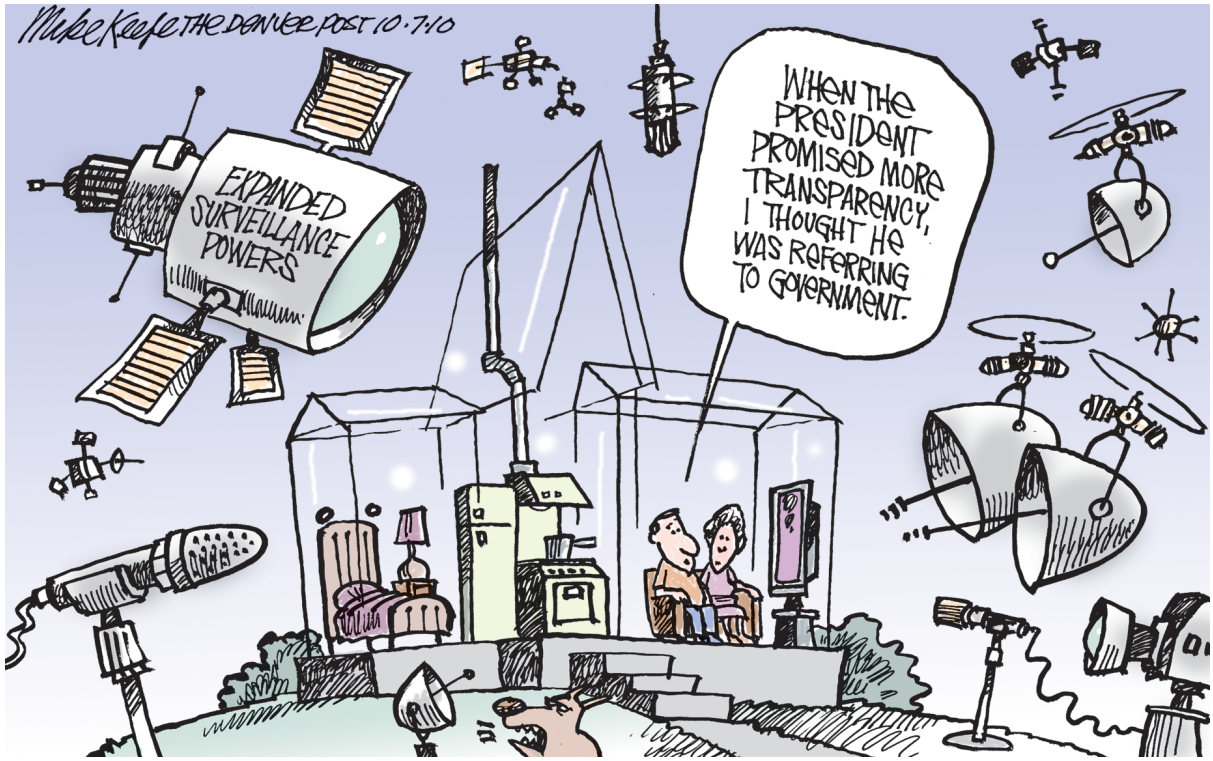

Fig. 0.1: "Expanded Surveillance" by Mike Keefe, published in *The Denver Post*, October 7, 2010. Used with permission of artist.

[48] Charlie Savage, "U.S. Tries to Make It Easier to Wiretap the Internet," *The New York Times*, September 27, 2010, https://www.nytimes.com/2010/09/27/us/27wiretap.html.

The cartoon is remarkable for its banality. A quick search online for "mass surveillance cartoon" yields countless similar images of suburban domestic life threatened by NSA agents peering through windows or hacking into telephones. One even finds examples satirizing the global effects of mass surveillance, both in terms of the NSA's ability to eavesdrop internationally or other national governments replicating American tactics of surveillance on their own citizenry. However, what's significant about the cartoon is how, in its caricature of post-9/11 American mass surveillance, we encounter a version of ubiquity that has less to do with the physical surfeit of surveillance technologies in everyday life than with their perceived displacement. If the intent of scaling up telecommunications monitoring was to preempt terrorist activity, why then does the white suburban couple suddenly find itself at the crosshairs of state surveillance? The simple answer of course would be that security requires transparency. If the terrorist threat is now no longer outside the political body but instead internal to it, then the state needs access to private domestic life to safeguard it before that threat can emerge, or so that the state itself can preemptively name the threat and thus neutralize it.[49]

The issue, however, is that the apparent displacement of surveillance technologies is predicated upon their differential distribution within security regimes. Here, normative citizens with "nothing to hide" are distinguished from minority groups that are already subject to surveillance in their public and private lives. In this case, security itself is the result of imperial and neoliberal policies that draw from older racial and colonial regimes of power to delineate sovereign "exceptional citizens" (such as the white suburban couple) as the benefactors of increased mass surveillance.[50] The PATRIOT Act is case in point. Signed in the immediate

[49] See Brian Massumi, *Ontopower: War, Powers, and the State of Perception* (Durham: Duke University Press, 2015), 10.
[50] Inderpal Grewal, *Saving the Security State: Exceptional Citizens in Twenty-First-Century America* (Durham: Duke University Press, 2017), 21.

aftermath of 9/11, the statute was intended to quell populist fears of racialized terror by installing an infrastructure of national security. However, while the PATRIOT Act has undoubtedly contributed to a new era of global mass surveillance in the twenty-first century, it is not entirely indicative of a watershed change in surveillance culture from a pre-9/11 era. As historians of security and US imperialism argue, US counter-terrorism initiatives were but an expansion of a Cold War era global counterinsurgency programs that targeted Black nationalists, communists, and civil rights activists in both the homeland and abroad in decolonial movements across the global South.[51] Considered in this context, the PATRIOT Act finds its antecedent in Cold War counterinsurgency programs like the FBI's COINTELPRO (1956–1971), a series of covert and illegal surveillance projects that targeted political dissidents involved in the Black Power Movement, the American Indian Movement, Chicano movements, and Puerto Rican independence movements. Importantly, for those subject to such programs, surveillance was already felt to be ubiquitous in the form of house raids, wiretapping, and undercover agents. In one particularly grievous case, the FBI hired an informant by the name of Rafael Marrero under the COINTELPRO program to infiltrate the revolutionary initiatives at the Puerto Rican Cultural Center in Chicago, even going as far as to marry into an activist family in order to gather intelligence and provide cover for his disruptive actions.[52] Ultimately, Cold War-era surveillance programs can be understood as experiments en route to a more expanded system of state security

[51] As Nadine Naber similarly explains that the "post-9/11" designation should rather be understood not as a political rupture in the history of US imperialism, but "as an extension if not an intensification of a post-Cold War US expansion in the Middle East," which brought about renewed contestation over the meaning of citizenship, nationalism, and civil rights. Nadine Naber, *Gender, Cultural Politics, and Activism* (New York: NYU Press, 2012), 61. See also Ronak Kapadia, *Insurgent Aesthetics: Security and the Queer Life of the Forever War* (Durham: Duke University Press, 2019).

[52] National Boricua Human Rights Network, "Betrayal in the Barrio: Rafael Marrero and FBI Repression against Chicago's Puerto Rican Independence Movement," *The Puerto Rican Cultural Center*, July 17, 2020, https://prcc-chgo.org/blog/2020/07/17/betrayal-in-the-barrio. This case is also documented in the 2010 film *COINTELPRO 101* by the Freedom Archives though interviews with members in the family in which Marrero assimilated.

that became legitimated by the attacks on 9/11 and visible within the post-Snowden global mass surveillance networks.

Understood within the historical legacies of colonial and imperial surveillance, the irony of the cartoon then isn't simply the reversal of transparency between citizen and government as the man claims, but rather that those for whom security measures were erected in the first place are suddenly the very object of interest. I argue thus that whatever ubiquity effects are produced by digital surveillance emerge as the result of the apparent expansion of racialized optics of threat and suspicion to white civil society made possible by the profusion of all-sensing devices across various contexts of power. Following Michel Foucault, this involves a "boomerang effect" wherein techniques previously used to control the marginal are now used to administer security to populations that enjoy the privileges of normative citizenship under late capitalism.[53] In the nineteenth century, colonial powers across the world, including those in Europe and Asia, first developed and perfected identification techniques like fingerprinting, passports, and registries upon colonized people and then imported those practices into their own metropoles.[54] Likewise, in the twenty-first century, argues Stephen Graham, "the resurgence of explicitly colonial strategies and techniques amongst nation-states such as the US, UK, and Israel in the contemporary 'post-colonial' period involves not just the deployment of the techniques of the new military urbanism in foreign warzones but their diffusion and imitation through the

[53] Michel Foucault, *Society Must be Defended* (London: Penguin, 2003), 103.
[54] See Radhika Mongia, "Race, Nationality, Mobility: A History of the Passport," *Public Culture* 11.3 (1999): 527–56; John Torpey, *The Invention of the Passport: Surveillance, Citizenship, and the State* (Cambridge: Cambridge University Press, 2000); Jane Caplan and John Torpey (eds.), *Documenting Individual Identity: The Development of State Practices in the Modern World* (Princeton: Princeton University Press, 2001); Simon Cole, *Suspect Identities: A History of Fingerprinting and Criminal Investigation* (Cambridge: Harvard University Press, 2001); Chandak Sengoopta, *Imprint of the Raj: How Fingerprinting was Born in Colonial India* (London: Macmillan, 2003); Christian Parenti, *The Soft Cage: Surveillance in America from Slave Passes to the War on Terror* (New York: Basic Books, 2003).

securitization of Western urban life."[55] We can witness this, Graham notes, in the way that Israeli drones previously used to target Palestinian life are sold to police forces across North America, Europe, and East Asia or through private military corporations that are contracted to secure reconstruction zones in both Iraq and New Orleans. We find similar boomerang effects in the TSA's use of x-ray technology initially developed for maximum security prisons[56] or in the application of class-based automated decision making systems used in welfare or social services within credit reporting, criminal sentencing, and business management.[57]

Taken together, the cartoon reveals how surveillance provides a unique site through which to interrogate ubiquity as a medial effect that emerges from processes of digital computation. Insofar as surveillance is imagined to operate everywhere, ubiquity is less a factor of the material excess of sensing technologies in the background of everyday life and more so contingent upon one's relationship to institutions of capitalism, white supremacy, and state power. Whatever can be said of ubiquitous surveillance is essentially the result of a more general anxiety concerning the allocation of threat to white civil society from its margins of excess. Thus, rather than reduce digital ubiquity to ideals of universalism and non-presence, we must instead take into account how social difference conditions the very technological processes of surveillance. Ultimately, by tracking how social difference shapes claims to ubiquity, we might better understand how surveillance, on a technological level, effaces its own distribution of violence within different contexts of state and corporate power.

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[55] Stephen Graham, *Cities Under Siege: The New Military Urbanis*m (London: Verso, 2010), xvii.
[56] Toby Beauchamp, *Going Stealth*; For a history of these airport biometric technologies, see Shoshana Magnet, *When Biometrics Fails: Gender, Race, and the Technology of Identity* (Durham: Duke Press, 2011); Kelly Gates, *Our Biometric Future: Facial Recognition Technology and the Culture of Surveillance* (New York: NYU Press, 2011).
[57] Virginia Eubanks, *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor* (New York: St. Martin's Press, 2017), 9.

*The Technics of Social Difference*

In order to track how ubiquity emerges as a medial effect in surveillance technologies, *After Ubiquity* argues that social difference serves as the primary mechanism through which computational systems are able to render the world transparent. A more bold version of this claim is that social difference operates as a technology, or technics, within surveillance that supplements the algorithmic processes through which bodies, identity, and environments become legible for power. In making this claim, I draw from more recent debates in media studies that consider the ontological and epistemological affinities between race and technology. On the one hand, some scholars argue that race itself could be understood as a technology insofar as it is an extension of the subject (a prosthesis) that operates as a mechanism for creating hierarchical differences among people.[58] In this case, race must be understood as a variation upon technology that can be used to locate the subject and produce identity within historically inflected systems of subjugation. On the other hand, other scholars suggest that while the "race as technology" framework is useful for grappling with the performative operation of race to apprehend the subject, it is nonetheless limited in its ability to address how technology itself is imbricated within recursive colonial formations of racial domination.[59] As Neda Atanasoski and Kalindi

[58] In her influential essay "Race as Technology," Beth Coleman tracks how race is neither a biological or cultural difference, but instead "adds functionality to the subject, helps form location, and provides information."[58] Beth Coleman, "Race as Technology," *Camera Obscura* 70, 24.1 (2009): 194. Similarly, Wendy Chun notes how race has historically served as "tool for subjugation" capable of establishing "hierarchical differences between people," such as in programs of eugenics and segregation. Wendy Chun, "Race and/as Technology, or How to do Things to Race, *Camera Obscura* 70, 24.1 (2009): 10.

[59] Such an argument stems from a debate over the applicability of the concept of Heideggerian concept of *technē* for understanding the technological function of race. As defined in his essay "The Question Concerning Technology," *technē* is as a mode of "bringing forth" that places technology in proximity to the fine arts understood as poiēsis. That is, what makes something technological here has nothing to do with specific material or scientific features, but instead pertains to the way that technologies make something available for thought and management by bringing it near and present. Martin Heidegger, "The Question Concerning Technology," in *The Question Concerning Technology and Other Essays*, trans. William Lovitt (New York: Harper and Row, 1977). However, as Wendy Chun notes, Heidegger's concept of *technē* must be understood within his broader commitments to German nationalist socialism which "reduced all humans to standing reserves: some to be destroyed, others to be optimized and made more productive." Wendy Chun, "Race and/as Technology, or How to do Things to Race, *Camera Obscura* 70, 24.1

Vora argue, technology is "a racial category in that it reiterates use, value, and productivity as mechanisms for hierarchical differentiation and exploitation within racial capitalism."[60] What's significant about this approach is how it stages race not simply as a product of technological processes, but rather as the condition of possibility for technology to emerge as an epistemological site of violence and visibility. Race here precedes technological developments of computation, such that computation itself, writes Jonathan Beller, is "the *long durée* digitization of the logic and logistics of racialization."[61]

While this dissertation is informed by these varying approaches, I take up the framework "technics of social difference" in order to consider how the technological is not so much productive of social difference as much as it (re)iterates upon social difference in order to produce different configurations of visibility within surveillance systems. In this case, I'm less interested in claiming that race is reducible to technology or vice versa than in tracing how social difference operates both prior to and as a product of surveillance systems in order to make data legible to regimes of power. To be clear, this is not to deny that surveillance itself is deeply bound to the racial contours of capital and colonial domination. Insofar as surveillance technologies have long functioned to locate certain bodies as objects of threat, it is indeed necessary to understand how the technosocial logics of computational media are contingent upon formations of racialized exclusion. While I adopt this position at various points across this dissertation, my aim in conceiving social difference as a technics is rather to understand how

(2009): 20. For a discussion of Heidegger's relationship to anti-Semitism and antiblackness, see also Kara Keeling, *Queer Times, Black Futures* (New York: NYU Press, 2019). At issue here then is how *technē* is itself rooted in racist epistemologies that would prohibit a reading of technology outside of certain colonial and capitalist systems of domination.

[60] Neda Atanasoski and Kalindi Vora, *Surrogate Humanity: Race, Robots, and the Politics of Technological Futures* (Durham: Duke University Press, 2019), 15.

[61] Jonathan Beller, *The World Computer: Derivative Conditions of Racial Capitalism* (Durham: Duke University Press, 2021), 65.

ubiquity is produced as a medial effect in the design and use of particular kinds of surveillance technologies. What becomes significant here is how social difference is both necessary for surveillance technologies to operate (as racial instruments) and effaced in that very operation (in order to portray ideologies of objectivity and neutrality). Social difference is that which ties together digital technologies and broader formations of cultural power under the sign of ubiquity.

At the core of my approach to understanding social difference as a technics is a desire to complicate particular arguments in surveillance studies and big data studies that consider how surveillance technologies purportedly aim to identity people based on presumably stable categories like race, gender, and sexuality. This would be the case, for example, with AI-based programs involved in criminal justice, insurance, or epidemiological monitoring that are said to discriminate against certain classes of people based upon biased records of historical data. In turn, some suggest that these systems could mitigate algorithmic discrimination by increasing the representation of marginalized communities in datasets.[62] While the discriminatory potential of such systems is no doubt real, the problem with this approach is that it situates social difference through a positivist framework of identity, such that there is an implicit assumption that data-based technologies operate faithfully to one's identity. And yet, as digital media scholars have shown, computational systems are in many ways ambivalent to the categories of political identity that shape human experiences of racial and gendered embodiment. Big data programs do not simply construct data profiles based on an individual's actions and beliefs, but rather through highly abstracted flows of "depersonalized" information that are culled from other people as well as nonhuman entities, like traffic, weather events, and the stock market.[63] Such flows of data are

[62] Sina Fazelpour and Maria De-Arteaga, "Diversity in sociotechnical machine learning systems," *Big Data & Society* (2022): 1-14.
[63] Tobias Matzner, "Beyond data as representation: The performativity of Big Data in surveillance," *Surveillance & Society* 14.2(2016): 203.

then processed and combined into templates that allow for vague patterns of data to be identified and modeled into ad hoc predictions about the world. What results, writes John Cheney-Lippold, is the transformation of identity into "measurable types" that are "directed toward operability and efficiency, not representative exactness."[64] These measurable types in turn displace categorical frameworks of identity as products of pattern analysis rather than preexistent features of the social milieu.

Following suit, I thus conceive of social difference as a technics in order to take stock of how data-based surveillance technologies abstract and reconstruct identity within processes of data transmission and pattern analysis. Importantly, this approach is neither intended to efface the unique ways in which surveillance is experienced by persons varying across race, gender, class, sexuality, disability, religion, nationality, and other forms of cultural difference. Rather, by locating social difference as a technics, I aim to demonstrate how surveillance organizes the social through racialized frameworks of visibility in ways that often exceed how we inhabit discrete structures of identity. In this case, I demonstrate how social difference works technologically to bring forth and render data legible within capital and colonial structures of domination—structures that are very often antiblack, transphobic, misogynist, and ableist. For example, I show how even as big data analytics like predictive policing and social media abstract data within correlational structures of proxy metrics, such abstractions are predicated by histories of structural racism that condition the means by which certain kinds of populations become visible for risk assessment. Likewise, I show how radar devices abstract identity through computational processes in ways that require human interpretation to isolate targets through vectors of racialized and gendered alterity. Across such cases, social difference not only informs

[64] Cheney-Lippold, *We Are Data*, 50.

how humans make sense of the inputs and outputs of surveillance technologies, but also structures the very technical diagrams that make data intelligible.

By tracking how social difference operates as a technics both prior to and as a product of surveillance, I further show how surveillant power unfolds through processes that scale across machinic and human forms of sensemaking. In this way, my research reflects more recent analyses of algorithmic systems as "sociotechnical assemblages" through which humans and technologies become entangled across complex webs of infrastructure, labor, policy, and cultural practice.[65] However, in my case, I'm not simply interested in how humans design and use technologies, but also how surveillance systems draw upon formations of racialized and gendered difference in ways that structure the very the operable dynamics of computation itself. Here then I contribute to more recent conversations in critical digital studies that seek to unearth the sociocultural histories that shape the mathematical and physical design of computational media. Such is the case for Tara McPherson who demonstrates how midcentury developments in digital computing emerged as part of a larger system of covert racism, or for Wendy Chun who reveals how eugenicist logics inform contemporary logics of homophily in machine learning.[66] At the core of such arguments is the claim that digital computation becomes operative through the "intra-actions of culture and matter" that are circumscribed by broader formations of capital and colonial domination.[67] Similarly, I demonstrate how social difference is remediated in the

[65] Tarleton Gillespie, "Algorithm," in *Digital Keywords: A Vocabulary of Information Society and Culture*, ed. Benjamin Peters (Princeton: Princeton University Press, 2016), 22. For other relevant literature on the sociotechnical approach to algorithms, see: Tarleton Gillespie, "The Relevance of Algorithms," in *Media Technologies: Essays on Communication, Materiality, and Society*, ed. Tarleton Gillespie, Pablo J. Boczkowski, and Kirsten A. Foot (Cambridge: MIT Press, 2014), 167-194; Ted Striphas, "Algorithmic Culture," *European Journal of Cultural Studies* 18.4-5 (2015): 395-412; Mike Ananny, "Toward an Ethics of Algorithms: Convening, Observation, Probability, and Timeliness," *Science, Technology, & Human Values* 41.1 (2016): 93-117.
[66] Tara McPherson, *Feminist in a Software Lab: Difference + Design* (Cambridge: Harvard University Press, 2018). Wendy Chun, *Discriminating Data: Correlation, Neighborhoods, and the New Politics of Recognition* (Cambridge: MIT Press, 2021).
[67] McPherson, *Feminist in a Software Lab*, 104.

design, governance, and use of surveillance technologies in order to produce configurations of visibility and violence at sites of racialized exclusion even as these differences are effaced through appeals to objectivity and efficiency. As a medial effect, then, ubiquity facilitates the proliferation of surveillance as a universal normative condition for digital lifeworlds that gathers up vectors of social difference in order to demarcate boundaries between security and disposability.

*Sites of Mediation*

In order to interrogate how ubiquity emerges as a medial effect in surveillance systems, each chapter of *After Ubiquity* focuses on a different site of mediation for surveillance that is by nature ubiquitous but nonetheless does not produce universal effects. By sites of mediation, I refer here not to a specific kind of technology or information device, but instead to the intermediary processes of media that encompass biological and technical lifeworlds. Here I draw from Sarah Kember and Joanna Zylinska's concept of "mediation," which refers to "the acts and processes of temporarily stabilizing the world into media, agents, relations, and networks."[68] For something to operate as a medium required that it be "articulated" as an assemblage of material vitality that structures the temporal flows through which life itself is sustained.[69] Such a definition has more recently has been adopted by media studies scholars to theorize media in an expanded sense as environmental, elemental, and atmospheric—for example, how fire and seawater structure ways of life.[70] In like manner, I consider how surveillance technologies

[68] Sarah Kember and Joanna Zylinska, *Life After New Media: Mediation as Vital Process* (Cambridge: MIT Press, 2012), xv.
[69] Kember and Zylinska, *Life After New Media*, xv.
[70] John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (Chicago: University of Chicago Press, 2015); Melody Jue, *Wild Blue Media: Thinking Through Sea Water* (Durham: Duke University Press, 2020).

articulate phenomena like the weather (chapter 1), DNA (chapter 2), electromagnetism (chapter 3), and play (chapter 4) as sites of mediation to track, classify, and sort populations. Such medial sites reveal how ubiquitous surveillance manifests across various domains of power, including the environmental, the biological, the microphysical, and the affective. Ultimately, by examining surveillance as a site of mediation and not simply as a set of technologies, I argue that we might better grasp ubiquity as an ongoing precipitation of political and social domination that suffuses the specific technical practices through which data is processed, identities are constructed, and power is exercised.

My intent in examining the ubiquity effects of surveillance across sites of mediation is to quell some concerns that one might raise when conducting an analysis of surveillance that simply focuses on its technological basis. By and large, technological studies of surveillance typically address how biases are built into computational systems in terms of data collection and platform design. One result of this approach is to call for more accurate algorithms or increased transparency of state and corporate policy.[71] However, at issue here is the failure to grasp how forms of surveillant power are exerted across a range of actors that cannot simply be fixed with practices of AI auditing or data cleaning. As Torin Monahan contends, "surveillance logics are woven throughout modern states and their institutions, so starting a critique with technology, while certainly practical and generative, may occlude deep-seated relations of power that are fused to conceptions of objectivity, transparency, and accountability."[72] While sympathetic to

[71] See for example Frank Pasquale, *The Black Box Society: The Secret Algorithms That Control Money and Information* (Cambridge: Harvard University Press, 2015). More recently, scholars within big data studies and critical algorithm studies have critiqued the Enlightenment ideals of discovery and revelation that compel us to open the black boxes of surveillance systems and how such ideals may conceal rather than reveal in providing a false sense of control or satisfaction. These include: Torin Monahan, "Algorithmic Fetishism," *Surveillance & Society* 16.1 (2018): 1-5; Mike Ananny and Kate Crawford, "Seeing without Knowing: Limitations of the transparency ideal and its application to algorithmic accountability," *New Media & Society* (2016): 1-17; Taina Bucher, *If... Then: Algorithmic Power and Politics* (Oxford: Oxford University Press, 2018).
[72] Torin Monahan, *Crisis Vision*, 20.

this critique, I argue nonetheless that relations of power are indelibly manifest within the design and operation of particular technologies, and further that digital technologies of constitutive of social and political formations. In this case, my approach to surveillance as a media studies scholar is less concerned with shoring up forms of bias and discrimination within technological systems than with showing how surveillance itself operates as a site of mediation that reanimates historical conditions of capital, colonial, and imperial power in ways that are only capable of producing bias and discrimination in their implementation within specific social contexts.

In order to approach ubiquity as a medial effect, I maintain that an analysis of surveillance thus must work across technical and aesthetic registers. To this end, across each chapter, I examine surveillance systems through both technical texts and creative objects. On the one hand, technical texts— including, scientific studies, user manuals, congressional reports, commercials, and patents—allow me to consider how digital systems encode logics of racial and gendered difference into their design and operation. Moreover, these materials are necessary not only to glean how specific technologies operate, but also to circumvent issues of expertise and secrecy that frequently prevent meaningful engagement with specific technologies used by the military, police, and corporations. And yet, more than merely descriptive of how things work, such materials are also objects to be studied in their own right, often articulating their own aesthetic engagement with surveillance through design choices, images, infographic, graphs, and so on. As such, I conduct close-readings of these materials to reveal how they convey ideologies of neutrality, objectivity, and rationalism that often conceal the differential effects of surveillance on marginalized populations.

On the other hand, I also turn to representations of surveillance technologies in popular film, television, video games, and contemporary installation art. I do so for two main reasons.

First, while some strands of media studies have an aversion to art, preferring instead media systems out in the wild (infrastructures, platforms, and databases), I consider how cultural modes of production contour the ways in which surveillance is as much technical as it is aesthetic, framed at once by the thresholds of computational and human modes of perception. In this case, such objects help attune us to the forms of sensemaking and patterns of experience that both underpin and are produced by surveillance technologies. This approach builds upon more recent scholarship on "critical surveillance art" that sees art as making legible on an experiential level how surveillance produces configurations of visibility and violence that are otherwise obscured by state and corporate authority.[73] While not promising to deliver ready-made solutions for resistance, art nonetheless enables us to trace out some of the farthest reaches of surveillance politics through speculative modes of encounter and imagination.

Second, art can offer an alternative archive of evidence that circumvents the problem of access that often attends surveillance systems. It is nearly impossible for the general public or trained scholar to examine, for example, the algorithmic architectures that subtend predictive policing software or social media platforms. This is not only because such data-based systems are proprietary (and thus restricted to a small class of officials or executives), but also because certain machine learning and AI programs themselves are riddled with issues of multidimensional complexity that make them opaque even to their programmers. While not promising to open federal, military, and corporate black boxes, creative works can instead make surveillance technologies available for analysis by framing their technical operations as

[73] Torin Monahan, *Crisis Vision: Race and the Cultural Production of Surveillance* (Durham: Duke University Press, 2022), 16. For exemplary scholarship on critical surveillance art, see: Elise Morrison, *Discipline and Desire: Surveillance Technologies in Performance* (Ann Arbor: University of Michigan Press, 2016); James Harding, *Performance, Transparency, and the Cultures of Surveillance* (Ann Arbor: University of Michigan Press, 2018); Kapadia, *Insurgent Aesthetics*.

discursive and perceptual effects. As such, in certain cases, I turn to art objects to consider how they stage particular surveillance technologies as sites of aesthetic encounter for a public audience.

*Chapter Outline*

By tracking surveillance across four distinct sites of mediation, the chapters of this dissertation refrain from presenting a consistent narrative that builds cumulatively towards a complete theory of ubiquity. Rather, each chapter engages a unique set of surveillance technologies used in different sites of power—from borders to war to policing to social media and more—in order to arrive at a common analytical framework for evaluating ubiquity as a medial effect that is animated by specific sociopolitical dynamics. In each case, I begin from the simple premise that a given medium of surveillance is ubiquitous in order to demonstrate how such media enable particular technologies to target, categorize, and discriminate through the technics of social difference. Additionally, each chapter proposes new a technical and aesthetic form (italicized below) that contours how structural forces of oppression are enabled by surveillance technologies. Such forms stand in for the aspirational claims of ubiquitous surveillance; if ubiquity has not yet been achieved, then such forms make present how surveillance produces effects of ubiquity on a technical and aesthetic level. And in doing so, they qualify how ubiquity serves as an organizing diagram for surveillance beyond the limiting frameworks of universalism and non-presence.

In addition, the chapters are not meant to be exhaustive of the breadth of global material and cultural practices of surveillance. Here I follow Alexander Galloway and Eugene Thacker who observe that it is precisely the "banality" of digital technologies in the global North that

"produces the effect of ubiquity, and of universality," but this is no doubt far from any concept of a "global ubiquity."[74] This is, of course, not to suggest that surveillance can't be experienced as ubiquitous elsewhere—as it always has been. Rather, I consider how medial imaginaries of ubiquity largely arise from specific contexts in the global North where surveillance dwells quite easily in the space between threat and convenience that occur under late-capitalist regimes of security and imperialism. For the present purposes, I limit myself to exploring ubiquitous surveillance in the context of the United States and in its transnational reach. In this way, this project tracks the global distributions of ubiquity through historical and contemporary American practices of policing, warfare, and border control. For example, in the chapter on electromagnetism, I trace the design and sale of radar technology from Israel to US military operations in Iraq and Afghanistan, while in the chapter on DNA, I show how American biotech companies have developed genetic surveillance technologies in conjunction with transnational movements for universal DNA databases such as in China. In addition, readers will no doubt notice points of resonance among the chapters and in some cases even revisit specific technologies under different contexts, reflecting what José van Dijck sees as the "whole ecosystem of connective media" that underpins the interlocking practices of data-based surveillance across federal, corporate, military, police, academic, and entertainment sectors.[75] To reflect such transnational developments in American surveillance, the chapters move from a focus on homeland policing and criminal justice to international systems of warfare and border security. I return to the global ramifications of ubiquity in the conclusion by considering the geopolitical violences that underpin the accomplishment of ubiquity as an effect of mediation.

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[74] Alexander Galloway and Eugene Thacker, *The Exploit: A Theory of Networks* (Minneapolis: University of Minnesota, 2007), 10.
[75] José van Dijck, "Datafication, dataism and dataveillance: Big Data between scientific paradigm and ideology," *Surveillance & Society* 12.2 (2014): 198.

Chapter 1, "Weathering Big Data" investigates how the weather is used as a proxy in big data programs like predictive policing and social media marketing to forecast behaviors like crime and economic consumption. In doing so, it offers the term *improxibility*—a portmanteau of impressibility and proxy—to consider how big data systems maintain claims to prediction by reanimating colonialist imaginaries of race, affect, and the environment within nineteenth century practices of criminal meteorology. If impressibility refers to the relational capacity of the body to be directly affected on a biological level by its environment, improxibility refers to the relational capacity of the proxy to perform as a predictive value within machine learning systems by establishing equivalence among correlated variables. By analyzing big data research and various industry publicity materials from HunchLab and Social Doppler, I show improxibility to be a technical and aesthetic mode of algorithmic governance that enables predictive analytic programs to exploit environmental stimuli in order to generate risk value out of group-differentiated vulnerabilities.

In Chapter 2, "Retrospecting Genetics," I explore how DNA is rendered into a ubiquitous and biologically innate medium of surveillance in DNA phenotyping. Most often used in criminal forensics, DNA phenotyping involves the extrapolation of physical features from genetic material to produce a digitally-rendered composite of a suspect's face. By examining genetics research and publicity materials from the company Parabon NanoLabs, I demonstrate how DNA phenotyping reflects a specific kind of temporal analysis in information sciences called *aoristic* analysis, which is used to describe methods for predicting past events within an unspecified timeframe. I show how the aorist, while largely developed for use in predictive policing software, clarifies how the prediction of facial features in DNA phenotyping is staged as the excavation of an unlived genetic past. Finally, I turn to installation work by the artist Heather

Dewey-Hagborg to consider how the aoristic connects more broadly to the social technics of the US security apparatus in order to produce differentiating effects of biometric surveillance.

The third chapter "Targeting Electromagnetism" shifts focus from sites of big data, social media, and policing within the United States to transnational practices of wartime surveillance. In particular, it examines how electromagnetism is rendered as a surveillance medium in through-the-wall sensors (TWS). Primarily developed for use in the War on Terror, TWS are electromagnetic radar technologies that enable one to detect movement behind walls. By analyzing scientific studies, user manuals, and federal reports, I argue that the physical concept of *dispersion* serves as a technical and aesthetic form that subtends how TWS detect and produce targets within sites of imperial war-making. In addition, by analyzing visual representations of TWS, including commercials from the Israeli-based global defense company Camero-Tech and film and video games in the Batman franchise, I show how dispersion underpins various racialized imaginaries of transparency within US security culture.

Finally, in the fourth chapter "Bordering Play," I show how play, as a ubiquitous feature of aesthetic life, can be used as a medium for surveillance within gamification systems. More specifically, it examines sites of border gamification: the transformation of borders by game mechanics to optimize security protocol. Key here is the concept of *flow*, which describes both the smooth movement of resources across borders as well as the optimal state of performance in which one is fully immersed in a gaming experience. Unlike previous chapters, this one is less technical in detail and more so engaged with the affective dynamics that enervate play as a ubiquitous medium for gamified surveillance. To this end, I turn to readings of real-world sites of border gamification like the Texas Border Virtual Watch and video games about borders like

Lucas Pope's *Papers, Please* (2013) to demonstrate how flow consolidates state-sanctioned racism and territorial performances of sovereign violence within experiences of gamification.

Surveillance has always dreamed of being ubiquitous. Across different regimes of power, surveillance systems were long deployed to assign identity, track movement, and distribute violence. At the same time, it is likewise true that emerging digital and networked technologies have exacerbated the ubiquitous potential of surveillance such that all of our thoughts, emotions, and behaviors are now subject to becoming datafied. And yet, as I demonstrate in the chapters that follow, such frameworks elide a much more complicated narrative in which ubiquity—with its ideals of neutrality and objectivity—is produced as an effect of mediation that obscures who is counted in the "we" that is subjected to such processes. Data might be collected about all of us, but that data is not used to produce equal effects of surveillance. At stake here then is how ubiquity at once prevents meaningful engagement with the differential impacts of surveillance and gives lie to the notion that certain democratic ideals like privacy are under attack by so-called biased or discriminatory algorithms. Ultimately, by revising our understanding of ubiquity to account for the differentiating violences of surveillance within global circuits of racial capitalism, neoliberalism, and imperialism, I thus argue that we might better track how ubiquity is animated by geopolitical formations of oppression rather than technoliberal futures of universality. It is precisely when we take ubiquity for granted that we ignore, historically and presently, how surveillance has always produced its own appeals to universalism and non-presence through specific processes of mediation.

# CHAPTER 1

Weathering Big Data: On Improxibility in Predictive Analytics

The weather has long been regarded as a prophetic medium. For centuries, clouds, winds, sunshine, and fog have circulated as auspicious or foreboding signs of the future within religious ceremonies, nautical exploration, agriculture, and warfare. As John Durham Peters remarks, "humans have always vigilantly watched the sky for signs of the times, and the worry about climate change continues the historical norm of reading our fate in the atmosphere."[1] Nowhere has the prognostic dimensions of the weather been more influential than in the history of data. As media historians like Friedrich Kittler and Paul Edwards have documented, the weather was central to transnational advancements in statistical science and digital computing in the nineteenth and twentieth centuries in order to develop techniques for numerical forecasting and predictive modeling.[2] Key here is how the weather unfolds as a chance phenomenon that jockeys between spontaneity and consistency. On the one hand, as an action of the deities or a consequence of planetary events, the weather indexes a natural order of things that transcends scales of human perception and intervention. On the other hand, through observation and measurement, meteorological events become embroiled in narratives of causative incidence, thus attesting to their regular and systemic behavior. Taken together, the weather emerges as an unbiased and causal medium for data-based analysis that allows us to make sense of our social relations.

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[1] Peters, *Marvelous Clouds*, 244.

[2] Friedrich Kittler, *Discourse Networks, 1800/1900*, trans. Michael Metteer with Chris Cullens (Stanford: Stanford University Press, 1990); Paul Edwards, *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming* (Cambridge: MIT Press, 2010). For other histories on the entanglements of weather prediction, data history, and war, see Joseph Masco, *The Theater of Operations: National Security Affect from the Cold War to the War on Terror* (Durham: Duke University Press, 2014); James Bridle, *New Dark Age: Technology and the End of the Future* (London: Verso, 2019); Jeremy Packer and Joshua Reeves, *Killer Apps: War, Media, Machine* (Durham: Duke University Press. 2020).

Now in the twenty-first century, the weather continues to underpin advancements in big data particularly as scientists use machine learning to model global climate patterns. And yet, beyond something to be predicted with statistical and machine learning methods, the weather has curiously reappeared as a predictive medium within state and corporate surveillance systems. This is the case, for example, with predictive policing and social media analytics software that use data on local temperature, wind speed, and rain to anticipate behavior like criminal activity or economic consumption. What's new here is how the weather serves as a *proxy* for human behavior within algorithmic systems. A proxy is an intermediary object that stands-in or substitutes for something else. Big data of course is rife with proxies as they enable one to uncover correlations in massive datasets that elude direct human observation, like using credit scores to hire job applicants or a driver's zip code to determine their auto insurance coverage. In climate science, too, scientists use proxies like tree rings, ice cores, and fossil pollen to reconstruct average global temperatures from specific time periods. In the case of predictive policing and social media software, however, the weather itself is transformed into a proxy that can potentially reveal latent behavioral inclinations when correlated with other variables of interest.

Importantly, what animates the capacity of the weather to act as a proxy is the apparent ubiquity of the weather itself. Unlike other proxies, like income and zip codes, the weather is an impartial atmospheric system that exceeds the scale of the human, one that seems to both pervade and shape social life. In this sense, big data systems construct algorithmic versions of what anthropologist Tim Ingold calls "weather-worlds"—those universal and enveloping atmospheres of frost, mist, and fog that bind collective forms of being through an ongoing and

shared precipitation of affects.[3] Indeed, if the weather is the same for everyone in a given city, then it can be used as a baseline condition for predicting anyone's behavior regardless of an individual's identity. And because the weather is ubiquitous, it can be correlated with any other kind of data source, like traffic activity, the stock market, and voting patterns. In turn, the weather allows algorithmic technologies to make sense of social relations while also displacing accountability from the personal to the environmental. Thus, part of the appeal of using weather data as a proxy for human behavior is that it extends the scope predictive analytics in ways that elide their potential for reinforcing inequality.

And yet, when such weather-worlds become sites for surveillance, we must question to what extent they are ubiquitously experienced under projects of state racism, capital accumulation, and resource extraction—and moreover to what extent the proxy itself brackets the weather's claims to prediction. In this chapter, I track how the weather is employed as a medium for ubiquitous surveillance in corporate and state big data predictive analytics. As I'll show, part of the appeal of using weather data as a proxy is to mitigate accusations of racial bias as well to buttress claims to accuracy and objectivity—a strategy which digital media scholars have variously tracked under the banner of what Ruha Benjamin calls the "New Jim Code."[4] However, while many of these scholars have focused on processes of algorithmic discrimination, I argue that the use of the weather as a medium for big data surveillance in fact draws its strength from the pre-digital ideology of climatic determinism: the belief that differences in civilizations could be accounted for by perceived affiliations between climates and racial traits. In particular, I

[3] Tim Ingold, "Earth, sky, wind, and weather," *Journal of the Royal Anthropological Institute* 13 (2007): S19-S38. Similarly, cultural geographer Derek McCormack writes, "meteorological variations are felt in domains of experiment and experience that exceed technologies of measurement. They are expressed through changes of color, temperature, and wind speed, and through the felt experience of these changes in ways that resist any neat ontological division between the material and the immaterial, or between surface and sky." Derek McCormack, *Atmospheric Things: On the Allure of Elemental Envelopment* (Durham: Duke University Press, 2018), 21.
[4] Ruha Benjamin, *Race After Technology*, 5.

focus on a key aspect of climatic determinist studies known as impressibility, which refers to the relational capacity of a living body to be impacted by its environment. Through impressibility, humans were thought to be causally influenced by heat, rain, and wind to pursue a number of given behaviors, most prominently crime. In contemporary big data programs, however, the weather no longer is thought to directly impact the body, but instead serves as a proxy to predict certain behaviors. Thus, rather than operating through impressibility, I argue that the weather instead serves as a medium for surveillance through what I'm calling *improxiblity*—a portmanteau of proxy and impressibility. If impressibility refers to the relational capacity of the body to be affected by its environment, then improxibility refers to the relational capacity of the proxy to perform as a predictive value within machine learning systems by establishing correlation among data. Ultimately, by taking an historical approach to the proxy, I demonstrate how contemporary developments in big data draw upon and reanimate colonialist imaginaries of race, affect, and the environment—even as such imaginaries are consistently effaced by the weather's ubiquity effects.

To contour the technical and aesthetic dimensions of improxibility, I first examine technical reports and publicity materials from the predictive policing software HunchLab to consider how the weather proxy extends theories of climatic determinism into the age of big data in order to predict crime. I then turn to the use of weather data in social media mood marketing such as the program Social Doppler to demonstrate how the weather can function as a proxy form of data visualization to predict behavior like economic consumption. In both cases, I argue that improxibility works to establish equivalence among independent variables through the correlations introduced by varying computational parameters, and in doing so shrouds the gap between correlation and causation. And yet, through the technics of social difference,

improxibility emerges as a mode of algorithmic governance that exploits environmental stimuli in order to generate risk value out of group-differentiated vulnerabilities. As a result, improxibility binds the weather to the active exercise of state power in order to mediate how the social ought to be structured to realize certain futures deemed necessary for the political community. I conclude by speculating what lessons improxibility might teach us in our current crisis of anthropogenic climate change.

Finally, it's worth clarifying that, of course, the weather and climate are not the same. While the weather describes day-to-day variations in the atmosphere caused by temperature, precipitation, and wind, the climate is a statistical description of variable trends in the weather often over the course of years, decades, and centuries. Nonetheless, as the history of predictive weather shows, such a distinction has not always been the most productive. Despite the epithet for their shared ideology, climatic determinists often looked to the weather to make sense of social, cultural, political, and economic relations over periods of historical and evolutionary time. Ellsworth Huntington, for example, cautions in his 1915 study *Civilization and Climate* that in order to "construct a map of climatic energy," one is "obliged to employ an approximation" by "assum[ing] that the continuance of a given condition produces the same effect as its temporary occurrence."[5] Consequently, I thus engage the predictive capacity of the weather rather than long term climate data in order to consider how environmental phenomena are imagined to act upon the body within localized scenes of algorithmic governance. Perhaps it is here in the synecdochal slip between weather and climate that the correlational power of the proxy finds its antecedent insofar as the droplet is mistaken for the cloud.

[5] Ellsworth Huntington, *Civilization and Climate* (New Haven: Yale University Press, 1915), 139; 137.

*Predictive Policing and the Weather Proxy*

> *It's the fourth of Tuesday in January and school is in session. There were 3 burglaries and 2 robberies yesterday. Six bars, three take-out stores, and a school are in the neighborhood. The forecast is 17° [Celsius] with cloudy skies. Where do you focus your 2 patrol vehicles?*[6]

The above narrative comes from a 2015 document titled "HunchLab: Under the Hood" intended to explain history, goals, and technical design of HunchLab 2.0. Developed by the Philadelphia-based firm Azavea in 2008, HunchLab is a predictive policing software that was acquired by ShotSpotter in 2018 and rebranded as ShotSpotter Connect (SSC).[7] According to company assets from ShotSpotter, SSC largely operates in a comparable manner as HunchLab by using similar data sources and machine learning techniques to predict crime.[8] As exemplified by HunchLab (and later SSC), predictive policing is "a multidimensional process" that involves the application of data analysis technologies to generate risk potential of future crimes through the analysis of multiple data streams, including previous crime history as well as information on individuals gathered from other police technologies, like social media analysis, biometric CCTV cameras, and automatic license plate readers.[9] However, what made HunchLab unique among other software is how it promises to predict crime by focusing neither on past criminal activity nor on individuals, but rather on the environment itself. As Azavea states, "HunchLab only

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[6] Azavea. "HunchLab: Under the Hood." 2015, accessed Nov. 11, 2020. https://cdn.azavea.com/pdfs/hunchlab/HunchLab-Under-the-Hood.pdf.

[7] The gun detection software developed by Shotspotter Inc. consists of acoustic sensors strategically placed in a designed public area (around twenty sensors for square mile) on street signs, traffic lights, and CCTV cameras. When a sound is registered by the sensors, the system uses machine learning to identify the acoustic event as a gunshot and triangulate its precise location in the surveilled area. However, despite claims that the system thwarts gun violence, as multiple studies have shown, the technology is extremely faulty and only compounds policing within communities of color. Jay Stanley, "Four Problems with the ShotSpotter Gunshot Detection System," *American Civil Liberty Union*, August 24, 2021, https://www.aclu.org/news/privacy-technology/four-problems-with-the-shotspotter-gunshot-detection-system.

[8] ShotSpotter Inc., "A Citizen's guide to ShotSpotter Connect," March 5, 2021, last updated September 23, 2021, https://www.shotspotter.com/wp-content/uploads/2021/03/ConnectCitizensGuide_v1_1.pdf.

[9] Simon Egbert, "Predictive Policing and the Platformization of Police Work," *Surveillance & Society* 17.1/2 (2019): 85.

makes predictions about places," and in doing so aims to "build models that are based upon the root causes of crime [rather] than just its manifestation (past events)."[10] To this end, the software takes into consideration not only previous criminal activity, but also environmental factors, such as information on the natural terrain, population density, specific geographic landmarks (public parks, bus stops, bars, and highways), and temporal conditions (like holidays, local event calendars, and seasons). Complicit here too is the weather.

At the core of HunchLab's approach to predictive policing is the use of "ensemble machine learning" in order to process data associated with a variety of crime forecasting models.[11] As Aaron Shapiro writes in his field work on the software, HunchLab is "single, theory agnostic meta-model" that "parses combinations of forecasting methods to determine the most predictively accurate model based on signals in local data."[12] Deploying a stochastic Gradient Boosting Machine (GBM), HunchLab build models for different types of crime (burglary, auto-theft, homicide, etc.) by first constructing a series of decision trees that determine where crime occurred and when based on a range of variables. Using an AdaBoost loss function, the model that results from these decision trees is then applied to the training data wherein incorrect predictions are weighted more heavily in future iterations of decision trees. Finally, after optimizing its crime models, HunchLab then produces risk scores for different space-time raster cells corresponding to physical locations, thus providing "geographic representations of risk for a specific crime model for a specific date and shift throughout the entire jurisdiction."[13] Ultimately, through its ensemble machine learning methods, HunchLab offers a "holistic" view

[10] Azavea, "A Citizen's Guide to HunchLab," updated July 11, 2017, accessed Nov. 11, 2020, http://robertbrauneis.net/algorithms/HunchLabACitizensGuide.pdf, 2.
[11] Azavea, "A Citizen's Guide to HunchLab," 5.
[12] Aaron Shapiro, "Predictive Policing for Reform? Indeterminacy and Intervention in Big Data Policing," *Surveillance & Society* 17.3/4 (2019): 462.
[13] Azavea, "Citizen's Guide," 23.

of criminal activity that promises a "heterogenous approach" focused on "multidimensional risk classification for urban areas."[14] It was for these reasons that numerous police departments across the United States quickly adopted HunchLab upon its release, including those in Chicago and Philadelphia, as well as by the St. Louis police department after the murder of Michael Brown in Ferguson in 2014.

What's significant here is how HunchLab, and later ShotSpotter, employs non-crime related variables as proxies in order to enable forms of prediction through correlation. A proxy operates as a "stand-in or a surrogate" that is "used to infer the value of an unobservable or immeasurable variable of interest."[15] They are a substitute for something, not the thing itself. Proxies thus allow us to *ap*-proximate certain values (the prefix ap- here meaning 'around'); that is to say, proxies circle around something, coming close, but not too close. As technical relations, proxies are nearly ubiquitous in contemporary algorithmic systems in order to infer correlations among massive datasets.[16] Howevever, proxies aren't just objects of data science, but rather emerge as governing organizational concepts within the historical present that enable new forms of knowledge production through speculation and uncertainty. As Dylan Mulvin explains, proxies perform cultural work insofar as they "enable the production of knowledge"—both within and beyond digital media systems—by introducing elements of "make-believe and surrogacy" that control uncertainty and unpredictability through appeals to authorized representation.[17] As "useful untruths," proxies ask us to suspend believe by "both analogizing and maintaining the relationship between that which *is* and that which works *as if*."[18] This

[14] Simon Egbert, "Predictive Policing and the Platformization of Police Work," 85.
[15] Levin, Boaz, and Vera Tollmann, "Proxy Politics: Power and Subversion in a Networked Age," in *Proxy Politics: Power and Subversion in a Networked Age*, ed. Vera Tollman and Boaz Levin (Berlin: Archive Books, 2017), 9-10.
[16] Cathy O'Neil, *Weapons of Math Destruction*.
[17] Dylan Mulvin, *Proxies: The Cultural Work of Standing In* (Cambridge: MIT Press, 2021), 4.
[18] Mulvin, *Proxies*, 25, 5.

difference, however, is not necessarily a deficit of proxies, but rather a strength. By suggesting a relationship among variables through correlation rather than causation, proxies open up a space of deniability that removes responsibility from predictive claims.[19]

In HunchLab, proxies ostensibly reveal subtle patterns in previous criminal activity that might be related with information on the environment. For example, if past historical crime data shows that physical assault tends to happen on weekend nights near nightclubs during warmer months, then HunchLab will model that specific crime type using a near-repeat model that includes landmarks, time, and local temperature. By mapping crime as if it were causally related to these variables, HunchLab thus uses proxies to open up a space of deniability that mitigates accusations of racially-motivated policing. As Azavea states, their use of non-crime related variables is intended to "diversify our picture of criminal risk" in order to focus on environmental factors of crime rather than previous criminal records.[20] Similarly, ShotSpotter Connect "supplement[s] local crime data with multiple sources of relevant data from independent, open sources to further reduce bias."[21] This approach is intended to distinguish the software from competitor predictive policing programs like PredPol, PRECOBS, ProMap, and Crime Anticipation System, all of which use past crime data to predict future behavior.[22]

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[19] As Wendy Chun observes, "proxies absolve one of responsibility […] by creating new dependencies and relations. Chun, "On Patterns and Proxies." For commentators on the proxy, the ambivalence of the proxy is a site for concern and liberatory potential. Indeed, the proxy is often framed as the embodiment of what Jacques Derrida termed a pharmakon, that which is both a remedy and a poison. For Levin and Tollman, the proxy as pharmakon is "a dialectical and essentially ambivalent figure" that enables both "distraction, obfuscation, suppression, secrecy, but also privacy, security and activity." Levin and Tollman, "Proxy Politics," 10- 11. Such ambivalence is further registered in Hito Steyerl's writing on the proxy, which she terms "a mercenary of appearance" that skirts the bounds of representation, emerging as both "devices or scripts tasked with getting rid of noise as well as the bot armies hell-bent on producing it." Hito Steyerl, "Proxy Politics: Signal and Noise," *e-flux* 60 (2014): e-flux.com/journal/60/61045/proxy-politics-signal-and-noise.

[20] Azavea, "Under the Hood," 19.

[21] ShotSpotter Inc., "A Citizen's guide to ShotSpotter Connect."

[22] According to Egbert, the near-repeat hypothesis "is the most prominent explanatory approach translated into algorithmic calculation processes for future crime risks." Egbert, "Predictive Policing and the Platformization of Police Work," 85. Quite simply, in near-repeat models, crime is thought to occur in places where it had occurred before. Key here is an emphasis on endogenous factors like the repetitive nature of recidivism as somehow emerging

However, as Azavea notes, the issue with using past criminal data is that such programs will only ever be able to perpetuate biases already present in policing practices.[23] Indeed, predictive policing software that intentionally excludes race and ethnicity might still propagate racial discrimination since information about previous crimes (like police contacts, gang affiliations, and prior arrests) are the result of other racially charged policing practices heat lists and stop-and-frisk.[24] By contrast, HunchLab aims to sidestep issues of racial bias by supplementing historical data on criminal activity with environmental proxies. In this case, any instance of racial discrimination that results from HunchLab's machine learning system can be blamed on the imprecision of the proxy itself rather than specific attitudes of policing.

Importantly, while HunchLab uses a number of environmental variables to model potential crime, there seems to be something particularly unique about the weather that makes it an especially productive proxy for mitigating racial bias. As a ubiquitous phenomenon beyond human design, the weather cannot be tied to specific socioeconomic conditions, like road infrastructure or patterns of urban development, that are coded with histories of systemic racism. In addition, unlike "geographic data sets" like the location of liquor stores, a "temporal data set" is not bound to specific geographic areas and thus can be applicable to any given raster cell in a

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from or belonging to a constrained geographic location. Other models like Risk Terrain modeling (used by HunchLab) instead would emphasize exogenous factors like the position of landmarks or other geographic markers as informing criminal activity. For a comparison of Near-Repeat modeling in PredPol versus Risk-Terrain modeling in HunchLab, see Martin Degeling and Bettina Berendt, "What's wrong about Robocops as Consultants? A technology-centric critique of predictive policing," *AI & Society 33.3* (2018): 347–356.

[23] Azavea, "A Citizen's Guide," 24. For a fuller discussion of how predictive policing perpetuates racial bias through the use of historical crime data, see Andrew Selbst, "Disparate Impact in Big Data Policing," *Georgia Law Review* 52.109 (2017): 109–195.

[24] In some cases, police departments will use social media monitoring to produce heat lists of individuals that are supposedly at risk of committing crime. This was the case, for instance, with the Los Angeles Police Department which contracted the independent tech start-up Voyager Labs to mine social media activity to target so-called radical Islamic extremists. Rachel Levinson-Waldman and Mary Pat Dwyer, "LAPD Documents Show What One Social Media Surveillance Firm Promises Police," Brennan Center for Justice, November 17, 2021, https://www.brennancenter.org/our-work/analysis-opinion/lapd-documents-show-what-one-social-media-surveillance-firm-promises. For more on the racialized basis of stop-and-frisk, see Michael White and Henry Fradella, *Stop and Frisk: The Use and Abuse of a Controversial Policing Tactic* (New York: NYU Press, 2016).

police department's jurisdiction.[25] To this end, HunchLab defines the weather by its own temporal variable (weather-*), wherein weather forecast data is used to predict crime in future periods and actual weather data is used to model crime in historical periods. Throughout, the weather emerges as a ubiquitous medium for surveillance across spatial and temporal bounds, thus becoming available to model any crime at any location and at any time. At the same time, the weather exceeds human design, thus removing any potential accusation of racial bias. Whatever predictions HunchLab produces are simply the result of machine learning systems tuned to meteorological phenomena that apparently beyond human intention.

And yet, even as environmental proxies like the weather might be able to provide a more holistic and non-biased view of crime, HunchLab and SSC are not immune from the violences of the police state. Whether operating through machine learning or not, policing itself is inextricable from the racial architectures of capitalism and white supremacy.[26] As the community-based grassroots organization Stop LAPD Spying Coalition asserts, data-driven policing is a continuation of "the history of imperialism and colonization [in which] occupying forces have used surveillance to monitor and contain populations they deem threatening, all for the purpose of maintaining their violent rule."[27] Central here is the conceit that even if race is absent as a discrete computational parameter, predictive policing nonetheless produces crime as a racially charged behavior that is designed to continually subjugate poor Black and brown communities. Following suit, scholars have variously commented upon how predictive policing reproduces crime within structures of institutional racism, colonial violence, and capital power

[25] Azavea, "Under the Hood," 20.
[26] Micol Seigel, *Violence Work: State Power and the Limits of Police* (Durham: Duke University Press, 2018).
[27] Stop LAPD Spying Coalition, "Automating Banishment: The Surveillance and Policing of Looted Land," November 2021, https://automatingbanishment.org.

on a technological level.[28] At the core of these claims is that discrimination is not something that can be fixed by weighting proxies differently, but is instead hardwired into the very algorithmic systems that predictive policing uses to organize social life. As Ruha Benjamin argues, predictive policing is "rigged" by antiblackness to produce the very crime that they predict, thus "giving the allure of accuracy."[29]

Such is the case too with HunchLab and the use of environmental proxies to predict crime. In his comprehensive analysis of the software, Joshua Scannell demonstrates how HunchLab, despite offering a reformist version of predictive policing through its holistic approach, "mobiliz[es] an American political economic infrastructure that defines group-differentiated exploitation and death as normal and depends on its racialized maintenance to function."[30] In this case, HunchLab leaves intact a particular worldview in which racialized communities are essentially violent or historically productive of violence, especially as those communities continually bear the brunt of an algorithmically structured apparatus of state power. While HunchLab might not target individuals per se, it nonetheless renders space itself as a site of potential risk, thus suggesting that any and all persons who enter into that space are immediately prone to committing crime. To be near a bar or in a low-income neighborhood is to be already rendered suspect because such spaces themselves infuse the body with a racialized history of criminal or recidivist potential.

In their both analyses, Benjamin and Scannell draw upon Christina Sharpe's notion of "the weather" as developed in her 2016 book *In the Wake* in order to consider how predictive

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[28] Jackie Wang, *Carceral Capitalism* (Cambridge: MIT Press, 2018); Brian Jefferson, *Digitize and Punish: Racial Criminalization in the Digital Age* (Minneapolis: University of Minnesota Press, 2020); Sarah Brayne, *Predict and Surveil: Data, Discretion, and the Future of Policing* (New York: Oxford Press, 2021).
[29] Ruha Benjamin, *Race After Technology*, 83.
[30] R. Joshua Scannell, "This is not *Minority Report*: Predictive Policing and Population Racism," in *Captivating Technology: Race, Carceral Technoscience, and Liberatory Imagination in Everyday Life*, ed. Ruha Benjamin (Durham: Duke University Press, 2019), 112.

policing is an expression and intensification of much longer projects of antiblackness, settler colonialism, and capitalist extraction. For Sharpe, the weather names "the singularity of antiblackness" that shapes the "atmospheric condition of time and place" through which Black non/being emerges.[31] This singularity importantly was formed within the historical economies of terror instantiated by the transatlantic slave trade and has continued to hold Black life in the longue durée of American racial state violence, such as in everyday catastrophes of de facto segregation, the school-to-prison pipeline, and immigration. Now, within the weather of predictive policing, Blackness continues to become fungible within a racializing digital calculus that allocates risk across geographic space in order to secure the future. In this case, the weather proxy renders computational cartographies of crime within which, as Sharpe remarks, "antiblackness is pervasive *as* climate."[32]

However, insofar as software like HunchLab directly incorporate meteorological data, we might take up Sharpe's concept of the weather in two ways: as a metaphor for the singularity of racial violence that surfaces across histories of policing, and as a literal reference to the specific environmental variables through which such racial violence is enacted. As Scannell observes, systems like HunchLab "enlist the plant itself as an agent of racialized state power, by rendering "criminogenic" the temperature, rain, and wind—the weather."[33] In this case, the weather quite literally calls attention to the way that meteorological events have long been used to construct crime as a racial object within data science. In what follows, I thus build upon such critiques to

[31] Christina Sharpe, *In the Wake: On Blackness and Being* (Durham: Duke University Press, 2016), 106.
[32] Christina Sharpe, *In the Wake*, 106.
[33] Scannell, "This is not *Minority Report*," 113. Similar to Scannell, Ruha Benjamin also draws upon Christina Sharpe's notion of anti-Blackness as climate in order to consider the ongoing systems of racial domination that suffuse predictive policing software. What is curious for Benjamin is how the modes of prediction proper to the weather are reversed in predictive policing. Indeed, crime is never an effect of accurate prediction, but rather constructed, the consequence of the ongoing policing and surveillance of poor Black communities. As she writes, predictive policing is precisely *not* like the weather "because unlike in natural weather forecasts, the weathermen are also the ones who make it rain." Benjamin, *Race After Technology*, 82.

track how predictive policing reflects a history of nineteenth century statistical science in which the weather was causally linked to specific forms of criminal behavior. Such an approach leads us not only to look at the algorithmic operations at work in HunchLab, but also at the historical formations of race and environment that subtend the use of proxies like the weather in big data programs.

*Criminal Meteorology and Impressibility*

Despite the novelty of predictive policing software like HunchLab, the use of weather data to predict crime is far from new. In the late nineteenth century, Russian anarchist Pyotr Kropotkin described a formula for predicting the quantity of murders that will occur in a month given regional differences in temperature and humidity: "Take the average temperature of the month and multiply it by seven, then add the average humidity, multiply again by two and you will obtain the number of homicides that are committed during the month."[34] The resulting equation $H = 2(t \times 7 + h)$ casts in stark mathematical terms the basis upon which the weather is thought to forecast criminal behavior. And, yet unlike HunchLab, the particular relationship between meteorological forces and the body is not simply one of correlation, but instead of direct influence. As Kropotkin elaborates, "Man who boasts of his free will is as dependent on the temperature, the winds and the rain as any other organism. […] When the weather is bad and the harvest poor the villagers become morose and their quarrels will take on a more violent character."[35] Like any other form of life, humans in this view are "dependent" on meteorological

[34] Cited in C. Bernaldo de Quirós, *Modern Theories of Criminality*, trans. Alfonso de Salvo (Boston: Little, Brown, and Company, 1912), 34; Harrington Cooper Brearley, *Homicide in the United States*, (Montclair, NJ: Patterson Smith, 1969 [1932]), 174-175.
[35] Pyotr Kropotkin, *The Essential Kropotkin,* ed. Emile Capouya and Keitha Tompkins (New York: Macmillan Press, 1975), 51.

phenomena, such that high temperature or precipitation leads one to aggressive activity. Importantly, such is not a matter of free will, but instead inevitability. For Kropotkin, the weather is an ordered and impartial system outside human intervention and design, a ubiquitous force that overwhelms social, biological, and environmental conditions to produce with precise certainty felonious behavior.

While Kropotkin's formula might seem dubious, it is nonetheless instructive insofar as it reveals how criminogenic weather has long found refuge in the ostensive objectivity of data. Following the deluge of statistical studies conducted and published in France and England from 1820 to 1840, practitioners of "criminal meteorology" in the nineteenth century cross-referenced crime statistics with weather data in order to ascertain the normative effects that the rain, temperature, and air pressure might have on criminal activity.[36] Just as computer scientists in the twentieth century would later identify weather forecasting as a potential enterprise for defending digital computation's claims to objectivity, nineteenth century researchers recognized the weather alongside certain social issues like crime and suicide as a key variable for securing the legitimacy of statistical science. No longer unruly and irregular, the chance circumstances of the weather were in Ian Hacking's terms "tamed" by statistical risk assessment models that supposedly disclosed the probable occurrence of impending criminal events.[37]

One of the first to link weather data to statistical models of crime was Adolphe Quételet, the Belgian statistician who later gained notoriety for describing the bell curve to model normative distribution. In an 1831 study, Quételet suggests that differences in climate, particularly average temperature, impact the propensity of crime at different ages.[38] Similarly, in

[36] de Quirós, *Modern Theories of Criminality*, 34.
[37] Ian Hacking, *The Taming of Chance* (Cambridge: Cambridge University Press, 1990).
[38] Adolphe Quételet. *Research on the propensity for crime at different ages*, trans. Sawyer F. Sylvester (Cincinnati: Anderson, 1911 [1831]).

a report published a decade later, he found that heat also determined the type and frequency of criminal activity. "During winter," he observes, "misery and want are more especially felt, and cause an increase of the number of crimes against property, whilst the violence of the passions predominating in summer, excites to more frequency personal collisions."[39] Here Quételet describes what was later termed by fellow statisticians as the "thermic law of delinquency," which maintains that warmer climates produce higher rates of aggravated assault.[40] Other statisticians and criminologists attempted to confirm the predictive nature of this law, including André-Michel Guerry, Enrico Ferri, and Cesare Lombroso.[41] Across their studies, weather phenomena like the temperature were thought to have a direct causal impact upon the body that drives it to certain kinds of behaviors or dispositions.

What's crucial across nineteenth century statistical studies of criminal meteorology is how they causally linked the weather, national borders, and moral character—a relationship more broadly crystalized within the ideology of climatic determinism. Climatic determinism is the belief that environmental conditions govern the perceived differences in political, economic, social, and cultural traits that develop across civilizations. For example, advanced civilizations allegedly arose in more temperate climates because excessive heat was reportedly detrimental to the white race, whose steady composure is leeched of physical and mental vitality when placed in tropical climates. In contrast, primitive societies were only to be found in geographic regions like jungles, deserts, and islands, because higher average temperatures stunted mental and

[39] Adolphe Quételet. *A treatise on man and the development of his faculties*, trans. R. Knox (New York: Burt Franklin, 1968 [1842]), 90.
[40] See de Quirós, *Modern Theories of Criminality*, 10; Brearley, *Homicide in the United States*, 162.
[41] André-Michel Guerry, *A Translation of André-Michel Guerry's Essay on the Moral Statistics of France (1833): A Sociological Report to the French Academy of Science*, ed. and trans. Hugh Whitt and Victor Reinking (Lewiston, NY: Edwin Mellen Press, 2002 [1833]); Enrico Ferri, *Criminal Sociology* (New York: D. Appleton and Company, 1899); Cesare Lombroso, *Crime: Its causes and remedies*, trans. Henry Horton (Boston: Little, Brown, Company, 1911 [1899]).

physical growth.[42] Importantly, climatic determinism itself is not restricted to one intellectual moment or cultural context. The idea is very old, tracing back to Greco-Roman antiquity in the writings of Cicero and Aristotle, the works of Arabian philosopher Ibn Khaldun in the fourteenth century, and seventeenth and eighteenth century Enlightenment philosophies such as from Montesquieu. Because such ideas were rampant before the initial studies of Quételet, nineteenth century statisticians and criminologists thus weren't so much observing correlations between delinquent behavior and meteorological data. Rather, they were mobilizing pre-existing conceptions of the weather as a totalizing atmospheric condition that compels the body into various affective orientations in order to bolster the objectivity of statistical research.

The mechanism through which the weather was thought to causally force the body to behave in certain ways is known as impressibility, or to the relational capacity of the body to be affected by its environment. As Kyla Schuller documents, discourses of impressibility were advanced in nineteenth century evolutionary science, particularly by Jean-Baptiste Lamarck, in order to describe "the capacity of a substance to receive impressions from external objects that thereby change its characteristics."[43] Here, certain energies and sensory stimuli originating in the environment were thought to modulate and refine the nervous system over evolutionary time.[44]

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[42] Ellsworth Huntington claims as such in his 1915 book *Civilization and Climate*, the main thesis of which is that the climatic conditions is the most important factor in determining the relative status and characteristics of a civilization. Reflecting the thermic law of delinquency, Huntington claims, "We know that the denizens of the torrid zone are slow and backward, and we almost universally agree that this is connected with the damp, steady heat." Huntington, *Civilization and Climate*, 7.

[43] Kyla Schuller, *The Biopolitics of Feeling: Race, Sex, and Science in the Nineteenth Century* (Durham: Duke University Press, 2018), 7.

[44] Similarly writing about Jean-Baptiste Lamarck, Sara Ahmed takes note of the agency attributed over to the environment in shaping how an organism develops evolutionary characteristics. Even if the environment does not directly alter the organism's structure, it nonetheless "shapes what an organism *needs* in order to survive." As a dynamic and changing configuration, the environment compels the organism to develop different kinds of habits and activities for which various bodily configurations are required. Whether direct or indirect, the body "receives the influence of the environment" insofar as it is directed to act a certain way." Sara Ahmed, *What's the Use? On the Uses of Use* (Durham: Duke University Press, 2019), 72; 73. For some feminist theories of the posthuman, the porous relations between the organism and environment might in fact be an asset towards conceiving of the entangled relations that give rise to a nonsovereign form of agency beyond the framework of a human

Such susceptibility was then inherited through national, tribal or family groups, codifying in racial types that could be managed by the state. As a technique of biopower, impressibility establishes an animacy hierarchy that distributes among populations the differential capacities of malleability and exposure in relation to environmental conditions.

Impressibility was central to theories of climatic determinism in order to explain how heat, wind, precipitation, and humidity could directly orchestrate the body's sensory-motor repertoires. In particular, impressibility was a key mechanism to justify political, social, and economic differences among racialized populations based on perceived differences in susceptibility to meteorological environments. On the one hand, Black and brown bodies were regarded as highly volatile under certain climatic conditions, an experience of "animatedness" that marked the racialized subject as being unusually receptive to outside forces.[45] Cesare Lombroso, for instance, argued that the impact of sunlight and heat "excites the nervous centers" when absorbed by skin with high degrees of melanin, which results in the overexertion of physical and mental faculties.[46] This biological impact could in turn apparently explain

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exceptionalism. Samantha Frost notes as such in her study of the human through the imbrication of various biological and cultural processes: "the fact that the effects of porosity endure over time, through creaturely life cycles, and across generations means than an organism is composed to merely through its encounters and engagement with its contemporaneous habitats but instead through the conjunction of the accumulation of prior responses-to-habitats and its responses to its contemporaneous habitat." Samantha Frost, *Biocultural Creatures: Toward a New Theory of the Human* (Durham: Duke University Press, 2016), 145. The risk of this kind of framework, Schuller demonstrates in her study of impressibility, is that one might neglect to consider the ways in which the very grammar of accumulation, time, and habit is grounded in eugenicist ideas that have overdetermined the environment's role in evolution through models of a certain racial genealogy.

[45] While animatedness might be defined simply as the state of being moved, Sianne Ngai observes how animatedness has also come "to function as a marker of racial or ethnic otherness in general." For Ngai, animatedness is a form of "racialized affect" that articulates an "excessively 'lively' subject and a pliant body unusually susceptible to external control," often resulting in "exaggerated expressiveness and hyperactivity." Sianne Ngai, *Ugly Feelings* (Cambridge: Harvard University Press, 2005), 94; 12.

[46] Lombroso, *Crime*, 3. The biological basis of impressibility is further commented upon by Albert Leffingwell, who concludes that "a continuous and gradually increasing wave of excitability or nervous exaltation affecting the entire human race in any given latitude would undoubtedly give rise to emotional manifestations, leading to action." However, it is only those in the human race "in the highest type of development" that can repress such nervous excitation, while "the selfish and pugnacious instincts of the half-civilized barbarians in our great cities" have a much higher propensity to activate such the effect of temperature on the body into "crimes of lust and resentment"

disparities in wealth and political power in colonized nations. On the other hand, climatic determinists also considered racialized bodies as insensate, immune to the fluctuations of temperature, air pressure, and humidity. Ellsworth Huntington reasoned that people indigenous to regions in the southern hemisphere (e.g. East indies, Africa, and South America) suffer from certain "climatic handicaps"—they are "dull in thought and slow in action," thus predisposed for enduring thermal energies.[47] Not surprisingly, impressibility was central to the expansion of colonial power in the development of the transatlantic slave trade. Huntington reasoned that enslaved Africans brought to new temperate climates, especially in the US, became more industrious and were more suited to work under hot climates as opposed to their white slave owners.[48] In this case, the subjugated position of Black life in the United States was regarded as incontrovertible proof of the weather's capacity to discipline and predict human behavior.

The precise degree to which impressibility could account for criminal behavior was a contentious topic among sociologists and statisticians during the late nineteenth and early twentieth century—that is, whether meteorological conditions directly operated upon one's somatic vitalities or was otherwise consolidated through cultural and social factors.[49] Yet, despite arguments in either direction, one fact remains consistent among such reports: within theories of climatic determinism, race rendered the body the gradual product of its meteorological

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or "murders and assaults with the intent to kill." Alfred Leffingwell, *Illegitimacy and the Influence of Season Upon Conduct: Two Studies in Demography* (London: Swan Sonnenschein and Company, 1892), 133; 134-35.

[47] Huntington, *Civilization and Climate*, 17; 35.

[48] Huntington, *Civilization and Climate*, 22-23.

[49] In his survey of criminological studies based on geographic and meteorological variables, Joseph Cohen remarks that by the time of his writing in the early 1940s, theories that espoused a rigid climatic determinism were largely abandoned. Postwar research instead considered "geographical and temporal variations in crime rates" as "expressions of involved social situations in which physical elements are present as components, but not as direct and primary causal influence." Indeed, if and when criminologist considered meteorological information, they did so not as having a direct influence on the body, but instead as "mediated by conditions of personality, culture, and social organization." Joseph Cohen, "The Geography of Crime," *The Annals of the American Academy of Political and Social Science* 217 (1941): 29.

environment. In mediating hierarchical relations between people, race operates as the elemental technical condition for impressibility; that is, race structured the body as a sensory-motor receptor that could be directly modulated by environmental conditions like the weather. As Schuller writes, race within nineteenth century theories of climatic determinism was not simply a fixed quality of populations, but rather a biopolitical stratagem for administrating "the uneven distribution of vital potential throughout national territory, including overseas colonies."[50] Racial difference manages the variability of the species by distinguishing between those bodies that are receptive to their climatic milieu, and thus able to refine their sensory capacities in the pursuit of proper life, and those bodies that are deemed volatile or insensate, outside the teleology of evolutionary progression. To be improperly impressible was to be assigned the status of flesh: debilitated and below the threshold of organic matter. Throughout, the weather justified the distribution of life within the national body politic according to racialized susceptibilities to heat, air pressure, and precipitation.

To witness the biopolitical logic of impressibility as it informed statistical research on criminal meteorology, consider a graph from the 1904 book *Weather Influences* by Edwin Dexter, professor of psychology and pedagogy and later chancellor of education in Puerto Rico in the early 20th century. The graph depicts the average rate of aggravated assault and battery in New York from 1891–1897 (y-axis) versus average windspeed (x-axis, miles per day) with two lines distinguishing gender (the cited reports document the arrests of 36,627 men and 3,134 women) (fig. 1.1). Here crime and windspeed are measured against each other in a linear

[50] Schuller, *The Biopolitics of Feeling*, 12. Schuller continues by considering how impressibility construes a "palimpsestic model of race" in which "racial status indexes the impressions that accumulate over the life span of individuals and the evolutionary time of race" (12). In this sense, race is not simply a description of the body's biological composition, but instead an ascription of the body's differential capacity to be affected over time, even over generations, thus producing a "compound inheritance of physiological capacity, political economy, aesthetic taste, cultural habit, religious practice, erotic relations, and sexual difference" (71).

regression plot, meaning that the independent variable on the x-axis (windspeed) causally impacts the dependent variable on the y-axis (assault). As the graph reveals, little crime occurs when there is no wind. However, as gales increase, so too does crime. With very high windspeeds, the rate of aggravated assault drops again.

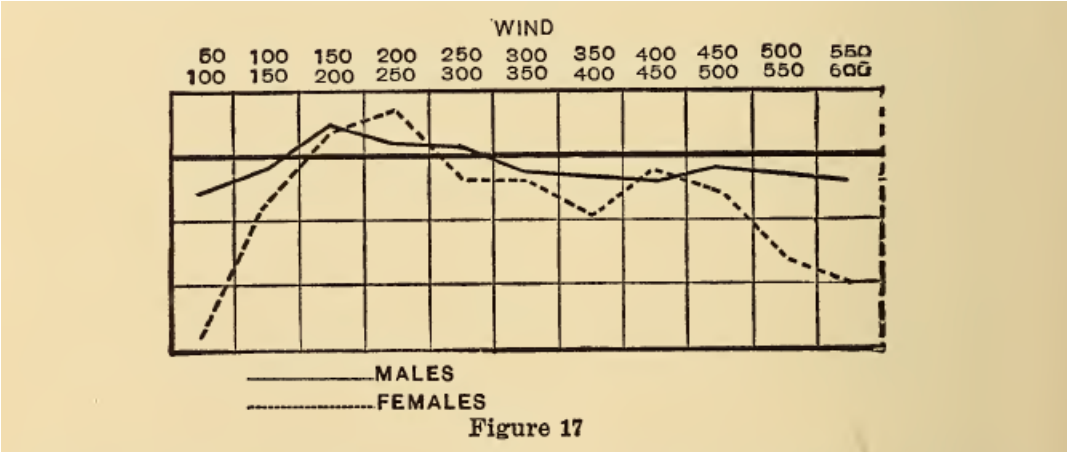



Fig. 1.1: A linear regression plot of windspeed (in miles per day) in relation to the average rates of reported aggravated assault in New York City (1891-1897). Edwin Dexter, *Weather Influences: An Empirical Study of the Mental and Physiological Effects of Definite Meteorological* Conditions (New York: The MacMillan Company, 1904), 152.

Dexter is a climatic determinist par excellence and uses the logic of impressibility to justify the causal relationship between crime and the weather. Across *Weather Influences*, he advances a model of biometeorology in which temperature, air pressure, humidity, wind, and precipitation have a direct metabolic impact upon the body.[51] According to Dexter, meteorological events "affect directly, though in different ways, the metabolism of life," defined as "those processes of oxidation […] which are the chemical basis of life as we know it."[52] The relation between windspeed and crime is exemplary of his metabolic view of impressibility. Drawing from an 1895 report published by the Smithsonian Institute analyzing the level of carbon dioxide in urban and rural areas, Dexter claims that highspeed gales provide better

[51] On the history of biometeorology, see: David G. Tout, "Biometeorology," *Progress in Physical Geography* 11.4 (1987): 473-486; Bouma, J.J.S.H.J.W., "A short history of human biometeorology" *Experientia* 43 (1987): 2-6.
[52] Edwin Dexter, *Weather Influences: An Empirical Study of the Mental and Physiological Effects of Definite Meteorological Conditions* (New York: MacMillan Company, 1904), 266.

ventilation to cities, thus circulating in fresh air from surrounding natural environments. Conversely, calm winds are unable to circulate fresh air into urban environments, thus resulting in an insufficient "atmospheric stock of oxygen."[53] In metabolic terms, calm winds are an example of a "katabolic process" because they "lessen the production of available energy as to reduce its quantity below the minimum required for life and health."[54] In the absence of strong winds, energy levels thus plummet, making city inhabitants lethargic. High winds by contrast circulate oxygen into urban areas, thus exciting the body and increasing its reserve energy. This energy, Dexter believes, is then misdirected to inappropriate, violent, and non-productive purposes.

While race seems to be absent from Dexter's version of impressibility, it's crucial to note that women in his graph seem to be relatively more impressible than men. At low wind speeds, women exhibit less violent behavior, but become relatively more aggressive as winds begin to circulate oxygen into their environment. Following Kyla Schuller, this is consistent with the way that "binary sex has come to accomplish the work of racial differentiation" within nineteenth century theories of impressibility.[55] Here the division of the civilized body into two sexed halves promulgates the dynamics of racial biopower insofar as the feminine takes on the negative position of environmental susceptibility described by impressibility. Thus, even as race is absent from this specific graph, it nonetheless structures the gendered forms of environmental vulnerability that occur within climatic determinism. The very supposition by which impressibility can produce gendered forms of criminal propensity from the weather is only

[53] Dexter, *Weather Influences*, 262.
[54] Dexter, *Weather Influences*, 267.
[55] Schuller, *Biopolitics of Feeling*, 17.

possible on the basis of a racialized distribution of animacy inherited from a much longer colonial project of climatic determinism.

Ultimately, statistical studies of criminal meteorology reveal how impressibility underpins how the weather was regarded as a systematic environmental phenomenon that could mechanistically modulate human behavior. Seemingly ubiquitous, the weather forces anyone who experiences it to engage in certain forms of activity despite one's efforts of self-determination. In this way, impressibility enabled criminal meteorologists to adopt the strategy of "environmental deferral" central to theories of climatic determinism, a strategy in which one could shift accountability from the offender to the environment.[56] As Nicole Starosielski explains, environmental deferral opens up "a loophole of denial," allowing one to suggest that whatever differentiating effects might be observed from specific weather conditions—like the fact that racialized bodies react to temperature differently—is only a matter of chance conditions beyond human control.[57] Sociologist Harrington Cooper Brearley summarized this attitude in his 1932 study of homicide in Unites States, suggesting that "if […] the climate is largely responsible for the type and amount of delinquency, the criminal is to that extent free from blame—he is merely a puppet in the hands of nature."[58] The sun shines and crime is inevitable. What was hidden here, however, is how impressibility was less an outcome of prescribed mathematical laws than a mechanism of racial biopower for controlling how a person fits into a larger population group for continued surveillance. The weather makes such differential effects seem emergent, rather than engineered.

[56] Nicole Starosielski, *Media hot and cold* (Durham: Duke University Press, 2021), 112.
[57] Starosielski, *Media hot and cold*, 112.
[58] Brearley, *Homicide in the United States*, 162.

*The Racial Technics of Improxibility*

In situating predictive policing programs like HunchLab and SSC within a longer history of nineteenth century criminal meteorology, it is not my intention to claim that the mechanisms of climatic determinism are alive and well today within big data predictive analytics as they were in years prior (although vestiges of climatic determinism have arguably persisted within late twentieth century sociological studies of the Temperature-Aggression Hypothesis and its application for policing).[59] While contemporary surveillance systems in the United States are inextricable from colonial logics of white supremacy, it would be a mistake to assume that big data programs rely upon the same models of impressibility. Indeed, if the weather was thought to directly affect bodies within nineteenth century statistical studies of criminal meteorology, in contemporary predictive policing software like HunchLab the weather instead serves as a proxy for crime. In this case, I aim to show how certain colonialist imaginaries of racial difference continue to underpin the predictive capacity of big data programs even as the technical architecture has shifted.

As an instructive point of entry into the transformations at stake in the proxy, consider here another graph shown in a presentation by delivered by an employee of Azavea at a 2017 conference hosted by New York University Law (at the time of this writing, the graph is

[59] The Temperature-Aggression Hypothesis (TAH) attempts to verify to what extent heightened temperatures result in aggressive behavior by impacting "the individual's affective state, way of thinking, or arousal level." Craig Anderson and Kathryn Anderson, "Temperature and Aggression: Paradox, Controversy, and a (Fairly) Clear Picture," in *Human Aggression: Theories, Research, and Implications for Social Policy*, ed. Russell Geen and Edward Donnerstein (San Diego: Academic Press, 1998), 253. While studies of the TAH remain largely inconclusive as to the precise mechanisms by which this phenomenon occurs (e.g., physiological processes, patterns of social behavior, behavioral motives, cognitive models), its application for policing is advanced as seemingly self-evident. In their 1998 overview of the various debates concerning the link between temperature and aggressive behavior, Craig Anderson and Kathryn Anderson suggest that accurately modeling the implications of the TAH might be useful for improving the police beat: "knowing when and where violence is likely to erupt (e.g., hot days and nights, near bars) may be used to change police presence patterns in productive ways." Anderson and Anderson, "Temperature and Aggression," 293.

available for view through NYU's website.)[60] The graph depicts the proxy variable windspeed (x-axis, miles per hour) in relation to the predicted risk score for aggravated assault in Chicago (y-axis) within HunchLab's machine learning system. While the x-axis measures windspeeds up to 25mph, the risk score, measured with the AdaBoost score, goes from -4.93 (low) to -4.88 (high). In the graph, very low windspeeds (nearly 0mph) yield a higher risk score (-4.88), which then plummets to a low point (-4.93) around 5mph to 10mph. The risk score raises slightly to a plateau (-4.92) around windspeeds of 17mph to 25mph.

While Dexter's graph depicts a linear regression plot showing how meteorological conditions directly influence crime rate, the Azavea graph is a Partial Dependence Plot (PDP). A PDP demonstrates the relation between a presumably independent variable and its effect on the outcome of a predictive model. They are useful for revealing the relevance of an input variable within so-called "black box" prediction models like GBMs in order to potentially reduce the large number of variables and their interactions that one might need to consider.[61] Statisticians Jerome Friedman and Bogdan Popescu describe it as such: "[PDPs] test for the *presence* of the corresponding interaction effects in the predictive model […] but do not necessarily reflect the importance of these effects to the overall variation [of that model]."[62] Put differently, a PDP shows the relative weighting of a single proxy within a machine learning system without reference to the other variable subsets that might also impact the predictive model. Importantly, however, as Freidman and Popescu suggest, PDPs do not reveal the overall effect of a given variable upon the final predictive model, but rather simply the marginal relevance of a given

[60] Jeremy Heffner, "Algorithms & Explanation: A Humble Framing," conference presentation, NYU Law, New York, April 28, 2017. Slides available here: http://www.law.nyu.edu/sites/default/files/upload_documents/Jeremy%20Heffner%20Slides.pdf.
[61] Jerome Friedman, "Greedy Function Approximation: A Gradient Boosting Machine," *The Annals of Statistics* 29.5 (2001): 1219.
[62] Jerome Friedman and Bogdan Popescu, "Predictive Learning via Rule Ensemble," *The Annals of Applied Statistics* 2.3 (2008): 935.

variable assuming there is no interaction among different variables of interest. PDPs are thus useful for making partially legible certain kinds of hidden technological processes, but are unable to attest to the overall predictive power of the variable within the machine learning system.

The particular PDP from Azavea's presentation visualizes the marginal effect of the windspeed variable within the machine learning model. It might seem at first glance that this PDP argues that low windspeeds produce more crime. However, the y-axis does not describe the observed rate of aggravated assault in Chicago, but rather its relative risk as measured by the AdaBoost score. The AdaBoost score refers to the measure of confidence of the prediction for the specific variable under consideration in the PDP rather than the amount of observed cases of assault. Thus, the PDP graph does not suggest that lower windspeeds produce more crime, but that as a proxy it predicts aggravated assault with more confidence at lower windspeeds within the machine learning system. This is perhaps because there are more records in the historical crime dataset of aggravated assault on days with minimal wind or because there are less observed cases of criminal activity on day with high gale speeds. In either case, the Azavea PDP simply shows the level of confidence of the machine learning system when using the windspeed proxy for predicting aggravated assault, rather than how much assault is created by difference rates of windspeed.

What do we make of this historical coincidence: two graphs, separated by one hundred years, both examining the relationship of windspeed versus aggravated assault? By comparing these two forms of data visualization from Dexter and Azavea, each produced at unique junctures in the history of data, it becomes clear that impressibility is an inadequate framework for describing how the weather proxy functions within contemporary big data predictive analytics. Whereas Dexter's graph models how an independent variable directly influences a

dependent variable, the Azavea graph shows the marginal impact of a proxy variable upon the predictive capacity of the machine learning model. I argue thus that in the turn towards proxy metrics in twenty-first century big data surveillance systems, impressibility has been replaced by what I call *improxibility*. Improxibility is impressibility through the proxy. If impressibility refers to the relational capacity of the body to be affected by stimuli within a given environment, improxibility refers to the relational capacity of the proxy to perform as a substitutional value within predictive analytics. It is the process by which proxies establish equivalence among independent variables through the correlations introduced by varying computational parameters. If proxies typically *ap*-proximate values by getting close, but never too close, then to be *im*-proximate (where the prefix *im-* signifies an orientation like "in" or "into") indicates something different: a movement into, an encroachment, a breach. Like fog on a balmy spring morning, improxibility shrouds the gap between correlation and causation.

Improxibility helps to explain how HunchLab's machine learning model enables proxies to become significant input variables for producing predictive claims about crime. In the PDP, different values for windspeed produce different confidence metrics referring to the likelihood that windspeed is able to correlate with aggravated assault. This likelihood is rendered as a risk score, suggesting that HunchLab considers higher confidence an indication that more criminal activity is to be expected. In this case, the AdaBoost score reveals not the impact of windspeed on particular populations purportedly susceptible to crime, but rather *the relational capacity of the proxy* to produce correlations in data assuming that the effects of all other variables are negligible. In this sense, improxibility has a regulatory function: it adjudicates the means by which proxies are able to establish proper and improper modes of correspondence between different variables. We might thus say that windspeed *improximates* aggravated assault —the

proxy suggests a direct impact of environmental conditions on target criminal behavior where no relation actually exists. Indeed, where PDPs seem to provide an argument for causation, there might not be as strong a relation between the wind proxy and the outcome of the machine learning model in terms of higher or lower risk of aggravated assault. Rather, through improxibility, HunchLab models the risk score outcome as the ability for the windspeed proxy to correlate with aggravated assault. And as more data about aggravated assault and windspeed are collected, the PDP might reveal different correlations among proxy and output variables. Improxibility thus lays bare how correlation is not a technical fact of big data analytics, but is rather refined over time by the transmission and reception of proxies in specific scenes of algorithmic governance.

By situating the weather proxy within a historical genealogy of climatic determinism, I further contend that improxibility reveals how big data predictive analytics conjure the specter of race purportedly absent from their computational design. Within nineteenth century theories of impressibility, racial difference established a grammar of correlation between biology and ontology, turning the body inside-out and rendering the biophysical an image of (un)civilization. Through the form of impressibility, the technical operation of race administered environmental susceptibility across populations, thus resulting in biologically-based climatic handicaps that flung Black, brown, and indigenous life towards social degeneration. In much the same way, I argue that racial difference is expressed as a technical relation in improxibility that enables proxies to translate correlation into equivalence, thus enabling the pretense of causality. The difference, however, is that in big data analytics, race is severed from the biological, no longer referring to the body as the epistemological conduit between corporeal surface and genetic makeup. Rather, improxibility locates race on the level of the "datalogical," a new ontologic of

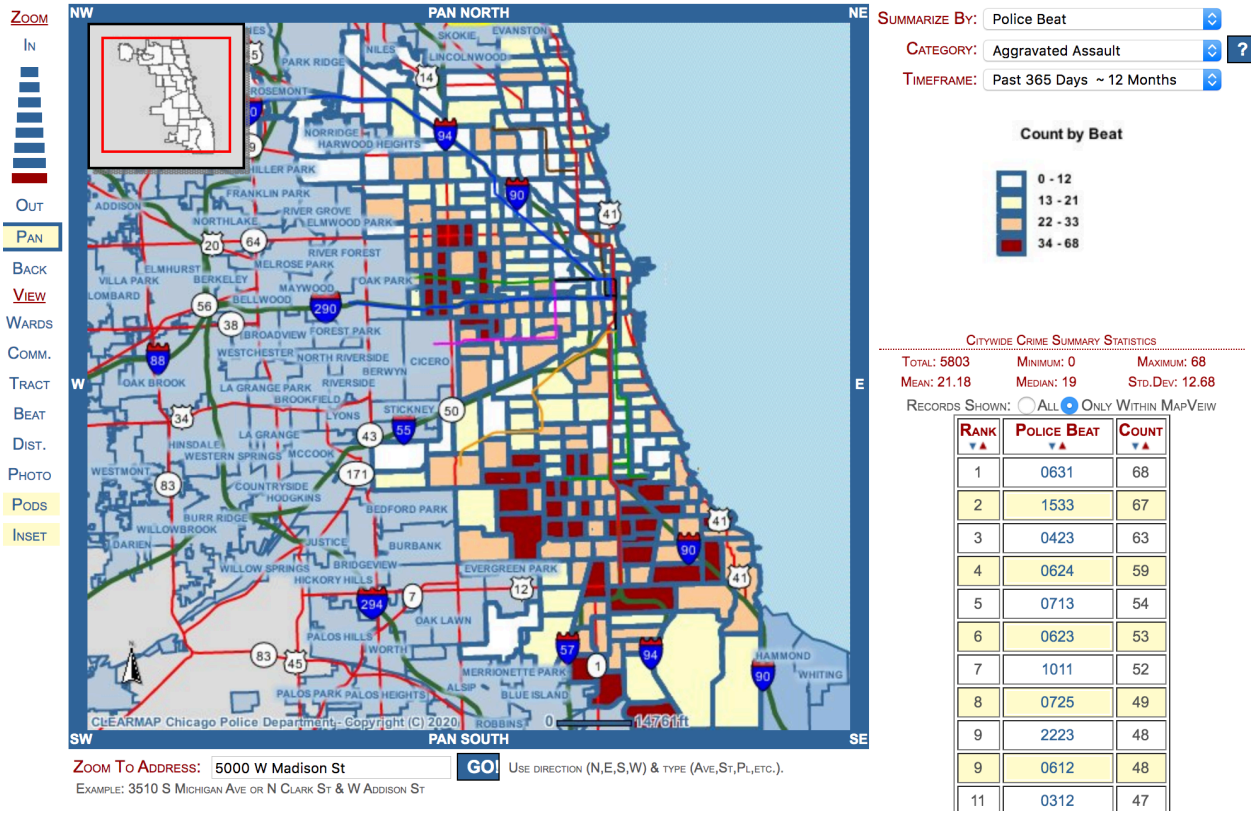
the social that operates through an analytic of non-representational parameters rather than the positivism of discrete systemic modeling.[63] Here racial difference subtends the complex relation that the datalogical weaves between input and output within predictive analytics. Put differently, as a technics, racial difference makes populations legible within a social logic whose lineaments are continually mediated by the uncertainties set up by proxy values. Racial discrimination here is not a matter of matching corporeal markers to a norm, but of modulating parameters of pattern analysis until proxy values confirm the patterns of racial identity that already structure historical datasets.

To witness the racial technics of improxibility, consider how HunchLab mobilizes the weather proxy to demarcate populations in need of security intervention despite the pretense that proxies allow the software to elude discrimination. Recall that what makes HunchLab unique among other predictive policing software is that it deploys a holistic analysis of crime that relies on data about environmental factors to ward off accusations of racial bias. It is for this reason that predictive policing companies like Avazea can claim that the violence which disportionately affects marginalized communities in the US is not the result of racialized policing and carceral capitalism, but rather of certain pre-existing environmental conditions. As such, the goal of predictive policing is to use algorithmic forms of governance in order to "prevent people from becoming victims" and "prevent an offender from being charged with the crime, which can reduce incarceration."[64] As such, HunchLab aims simply to curb the purportedly evident effects of variables like wind speed upon criminal behavior rather than to question the power systems that enable such proxies to be valued in crime prediction in the first place.

[63] Patricia Clough, *The User Unconscious: On Affect, Media, and Measure* (Minneapolis: University of Minnesota Press, 2018), 103-4.
[64] Azavea, "Citizen's Guide," 26.

However, if the chance nature of the weather can predict crime, this is only because populations ostensibly susceptible to wind speed have already been structured through technologies of racial subjugation and exploitation. According to the Chicago Police Department's 2017 Annual Report (the same year as the Azavea presentation at NYU Law), the vast majority of reported cases of aggravated assault is found in South Side communities that are majority Black.[65] Similar patterns of reported crime are observed in more recent annual reports as well as the CPD's CLEARMap geospatial software (fig. 1.2). To be sure, such high rates of aggravated assault in these areas is not simply the effect of windspeed, but rather (to recall Sharpe) expressions of the singularity of anti-Blackness that has taken shape across centuries of racial segregation, voter disenfranchisement, public school closures, and infrastructural inequalities. Such group-differentiated vulnerabilities authenticate the weight given to environmental proxies—such as the weather, but also seasons and moon phases—when made to predict crime in the machine learning program. That is, calm winds might result in a better model for predicting aggravated assault in Chicago, but such is the case only in *specific* communities where years of structural racism bolster the relational capacity of proxies to correlate with criminal activity. Improxibility thus reveals not only how proxies are able to establish correlation among various kinds of data, but also how they generate risk value out of group-differentiated vulnerabilities made possible by the racial infrastructures of capital and colonial violence. In short, improxibility is a racial technics.

[65] Chicago Police Department, *Annual Report*, 2017, https://home.chicagopolice.org/wp-content/uploads/2017-Annual-Report.pdf.




| Rank | Police Beat | Count |
|---|---|---|
| 1 | 0631 | 68 |
| 2 | 1533 | 67 |
| 3 | 0423 | 63 |
| 4 | 0624 | 59 |
| 5 | 0713 | 54 |
| 6 | 0623 | 53 |
| 7 | 1011 | 52 |
| 8 | 0725 | 49 |
| 9 | 2223 | 48 |
| 9 | 0612 | 48 |
| 11 | 0312 | 47 |

Fig. 1.2: A geographic visualization of the total number of aggravated assaults in Chicago during 2019. Produced in 2020 with the Chicago Police Department's online CLEARMap software: http://gis.chicagopolice.org. Screenshots by author.

By juxtaposing HunchLab's PDP alongside Dexter's plot, we witness how the weather gestures to a new technical configuration of improxibility that underlies big data predictive analytics. Here, improxibility both reveals how the proxy is able to establish correlation among various kinds of data and generate risk value out of group-differentiated vulnerabilities. And yet, despite my focus on HunchLab and SSC, the weather proxy is not specific to predictive policing software that use data on meteorological conditions to predict crime. Rather, big data predictive analytics can also use the weather as a proxy to visualize the networked spread of human affect. In what follows, I track how the weather proxy is mobilized in the social media analysis software Social Doppler to map how sentiment spreads to different populations over time and space, much like a rainstorm, which in turn can be monetized for targeting advertising. In doing so, I show how improxibility draws upon the ubiquity effects of the weather in order to adjudicate how the

social ought to be structured to regulate behavior for the most optimal conditions of capital production.

*Social Media Sentiment Analysis and Weather-Based Marketing*

> *Our customer […] is a small surf shop or retailer in Venice Beach, California. […] The customer came to us with a problem, which is they are unhappy with the return that they currently get from their current funds that are geared towards advertising and marketing. How can a small to medium-sized company utilize location analytics to better target their customers and provide them a way to be notified of the goods that they are reselling at the time that the customer is most inclined to make a purchase?*

The above scenario is drawn from a webinar hosted by representatives from Geographic Communication Systems, a "geospatial solutions company that delivers intelligent analytics to cloud networks and local platforms to provide answers to complex business problems."[66] The purpose of the webinar is to instruct potential clients on the power of a new geospatial intelligence tool under development called Social Doppler, which enables "continuous sentiment analysis for social media feeds to forecast marketing opportunities." While typical marketing tactics make use of "static data" (like census information, population density, and income), Social Doppler aggregates publicly available data from Twitter in order to predict the general sentiment of a given population over time. The software, in their words, draws from social media in order to generate "weather patterns" of sentiment that describe how moods shift and spread. Referred to as "cultural meteorology" in the webinar, Social Doppler extends a much longer tradition of research programs in cultural anthropology, such as The Mass Observation Society, which attempted to create "weather-maps of public feeling" based on survey responses in the

[66] Geographic Communications Systems, "Geospatial Big Data: Leveraging Location Analytics," webinar, Oct 24, 2013, accessed Nov. 11, 2019, https://www.youtube.com/watch?v=H06qlm_2s0g.

early twentieth century.[67] However, what distinguishes Social Doppler here is how its weather maps can be exploited to predict a population's susceptibility to marketing efforts in real-time through statistical analysis of social media activity. As the GIS representatives state in the webinar, the ability to predict where and when customers are most inclined to make a purchase can drastically benefit efforts for mobile targeted advertising.

Social Doppler is part of a larger suite of technologies, apps, and studies that fall under the rubric of social media sentiment analysis (SMSA). SMSA is the use of geospatial and linguistic software to analyze expressed sentiment in social media posts. Found across a range of social media studies and third-party software applications, the goal of SMSA is to determine how likely it is that a given population within a specific geographic range is experiencing a range of emotions based on the content of their social media activity, including posts on Facebook, Twitter, Instagram, and Snapchat. Notable examples include Visible Technologies (in partnership with In-Q-Tel, the venture capital firm that supports the CIA), the Mappiness Project from the London School of Economics, and the Facebook Gross National Happiness index. Importantly, SMSA is not intended to describe a single person's emotions over a period of time, but rather provide a snapshot of a population's mood at a specific moment using social media content in order to produce sentiment itself as a variable that can be manipulated within network structures. As Mark Andrejevic notes, "applied to sentiment analysis, the goal of data mining is both pre-emptive and productive: to minimize negative sentiment and maximize emotional investment and engagement—not merely to record sentiment as a given but to modulate it as a variable."[68] In this case, SMSA keys into contemporary debates concerning control in affective

[67] Caleb Crain, "Surveillance Society: The Mass-Observation movement and the meaning of everyday life," *The New Yorker*, Sept. 3 2006, https://www.newyorker.com/magazine/2006/09/11/surveillance-society.
[68] Mark Andrejevic, *Infoglut: How Too Much Information Is Changing The Way We Think and Know* (New York: Routledge, 2013), 46.

economies, wherein capital invests less in the labor of the body than in, as Patricia Clough argues, "modulating or manipulating the population's affective capacities."[69] Through large-scale studies of text on social media, users are managed not as individual subjects, but as aggregations of sentiment that can be shaped to produce new profit-driven structures of desire. In some cases, SMSA like Social Doppler allows for improved real-time targeted advertising, but in other cases like Cambridge Analytica it may be used to shape public policy or influence political campaigning. Ultimately, by both predicting and modulating population sentiment, SMSA applications gesture towards the governmental capacity of algorithmic systems that animate social media networks.

Like HunchLab and its predecessors in statistical criminal meteorology, SMSA draws upon a longer history of endeavors to measure sentiment as a process of impressibility within nineteenth century economic theory. In an 1881 publication, philosopher and political economist Francis Edgeworth described an imaginary instrument known as the hedonimeter that could continuously analyze sentiment in real-time, thus enabling economists to develop a physiological account of utility—the pleasure or satisfaction one receives from certain commodities.[70] Inspired by contemporaneous psychophysicists like Ernst Weber and Gustav Fechner who sought to relate empirical and observable physical stimuli to the sensory events within an individual's consciousness, Edgeworth designed the hedonimeter to compute statistical comparisons of sentiment by directly quantifying the body's experience of happiness or pleasure.[71] As he writes,

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[69] Patricia Clough, "The New Empiricism: Affect and Sociological Method," *European Journal of Social Theory* 12.1 (2009): 50.

[70] While neoclassical economic theory understands utility as a measure of worth or value when a consumer makes decisions about their preference for certain products, nineteenth century economists were largely influenced by the utilitarian writings of Jeremy Bentham and John Stuart Mill, for whom utility meant a measure of pleasure or satisfaction. For Bentham in particular, utility amounted to a cost-benefit analysis of the relative impact of pleasure and pain.

[71] See Erica Fretwell, *Sensory Experiments: Psychophysics, Race, and the Aesthetics of Feeling* (Durham: Duke University Press, 2020).

the hedonimeter is "a psychophysical machine continually registering the height of pleasure experienced by an individual, exactly according to the verdict of consciousness, or rather diverging therefrom according to a *law of error*."[72] While the hedonimeter would have allowed economists to develop theories for maximizing national utility by appealing to the body's psychophysical substrates, Edgeworth's thought experiment was largely abandoned by the early twentieth century as economic theory began prioritizing pragmatic assessments of choice and preference satisfaction over desire and feeling.[73]

While Edgeworth's hedonometer was never built, the practice of measuring sentiment has flourished in the age of social media. Indeed, social media is invaluable in sentiment analysis for two reasons. First, researchers argue that the study of macroscale sociotechnical phenomena, like sentiment, requires enormous amounts of data. Edgeworth notes in his commentary on the hedonimeter that the problem of proving sentiment through self-observation can be overcome by aggregating large swaths of data to produce averages the normalize across measured subjects.[74] In much the same way, social media platforms amass vast archives of content that can be mined for sentiment analysis, complete with timestamps and geolocation data. Second, social media allow researchers to overcome the problem of self-reporting, wherein sentiment is often narrated differently in hindsight. Unlike sociological studies that use questionnaires to probe sentiment, or contemporary projects like Mappiness or the Gallup Well-Being Index that use internet and

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[72] Francis Ysidro Edgeworth, *Mathematical Psychics: An Essay on the Application of Mathematic to the Moral Sciences* (London: C. Kegan Paul and Co., 1881), 101.
[73] David Colander, "Edgeworth's Hedonimeter and the Quest to Measure Utility," *The Journal of Economic Perspectives* 21.2 (2007): 215-226.
[74] For Edgeworth, the hedonimeter allows one to mathematically compare different individuals' feelings of pleasure by introducing statistical aggregation. Indeed, a key problem for measuring utility is that any account of individual pleasure is subject to error through one's self-observation of that sensation. To resolve this issue, the statistician treats the individual as an element in a population, using the hedonimeter to quantify physical sensation into discrete units of analysis. As he writes, the "greater uncertainty of hedonimetry in the case of others' pleasures may be compensated by the greater number of measurements, a wider average." Edgeworth, *Mathematical Psychics*, 102.

phone surveys, SMSA projects extract sentiment from non-significant data using text-parsing algorithms.[75] As such, sentiment is identified from "in-the-moment expressions that reflect users' current experiences," making platforms like Twitter and its medium specific constraints for communication "an ideal candidate input signal for a real time societal 'hedonometer.'"[76]

Within SMSA, sentiment is measured through language that appears within social media content. Put differently, language is used a proxy for sentiment. In this case, language itself doesn't immediately directly convey sentiment, but instead operates as a substitute through which expressed feelings like happiness or sadness can be indirectly measured. Central here is what Andrejevic tracks as "non-content-based analysis," in which "statistical proxies for affective intensities displace reference, meaning, and comprehension."[77] In non-content-based analysis, a user's emotional state is determined not by the definitional meaning of particular words, but rather by the aggregate sentiment score expressed within user-generated text. In some cases, this might involve using a Linguistic Inquiry Word Count (LIWC) sentiment analysis tool, which compares words to a user-defined dictionary with entries associated with psychologically-relevant categories, in order to assign particular terms a sentiment score. In other cases, to account for internet abbreviations and Twitter-specific syntax, other programs might employ Mechanical Turk to obtain happiness levels of individual words and then use a word-frequency distribution algorithm to scale up to the whole text. In either case, after assigning particular

[75] Following Richard Easterlin's attempts to measure happiness using self-reported survey data in the early 1970s, many social scientists attempted measure sentiment and mood using paper form submissions. However, paper form submission often introduced breaks and delays in measurement that allowed for performative, intentional, and self-conscious reporting of individual moods. Digital media, on the other hand, claims to shorten the time between experience and reporting, allowing survey subjects to self-report in real-time. Mappiness is one such example that uses online distribution of surveys, while other studies use diary reports to reduce retrospective bias. Niall Bolger, Angelina Davis, and Eshkol Rafeli, "Diary Methods: Capturing Life as it is Lived," *Annual Review of Psychology* 54 (2003): 579-616.
[76] Peter Dodds et al., "Temporal Patterns of Happiness and information in a global societal network: Hedonometrics and Twitter," *PLoS ONE* 6.12, e26752 (2011): https://doi.org/10.1371/journal.pone.0026752.
[77] Andrejevic, *Infoglut*, 54.

words a sentiment score, SMSA then identifies the relative degree of sentiment based on the frequency and proximity of those terms within a given social media post. Sentiment thus is not disclosed by the presence of individual words, but instead "proxies for sentiment are used to gain a general overview of the aggregate."[78] For example, while the term "happy" might be labeled with a positive sentiment score, it must be analyzed within the context of a range of other terms like "sick" or "tired" which might be coded with negative sentiment. A tweet that reads "I'm not happy because I am sick and tired" thus would yield an overall negative sentiment score due to the frequency and proximity of select terms and their sentiment scores. What's significant here is how sentiment is no longer materially situated in the body but instead the result of the statistical aggregation of language proxies.

Like HunchLab, SMSA mobilizes the weather in order to track and predict how sentiment is distributed across social media networks. On the one hand, some projects like the Hedonimeter from the University of Vermont attempt to show how weather-related terms can be assigned sentiment scores in order to predict the emotional status of social media users.[79] However, far more relevant to understanding the ubiquity effects of the weather in big data surveillance is how some SMSA studies examine how meteorological events directly impact the expressed sentiment of social media activity. Here, researchers analyze content from platforms

[78] Andrejevic, *Infoglut*, 54

[79] The Hedonometer attempts to build an algorithm for determining how sentiment can be extracted from text-based content. Analyzing the perceived sentiment from 4.586 billion tweets posted over a period of three years, the researchers demonstrate how sentiment shifts over time (daily, weekly, monthly, yearly) and how significant events shape public moods (holidays, celebrity deaths, natural disasters) by assessing how groups of related terms possess positive or negative correlations with specific moods. To do so, they isolated what they call the "ambient happiness" of a given word: how the happiness rating assigned to an individual word (obtained via Mechanical Turk) impacted the average happiness level of all other words that co-occur within a given tweet. Among the terms with the highest scores for ambient happiness were *happy, love, sun, summer, winter, Stephen Colbert, cash, USA, God, Jesus, kiss,* and *family*. On the other end, terms like *cold, climate, rain, snow, gay, Muslim, war, guns, drugs, Afghanistan*, and *flu* were found to have the most negative impact on the overall tweet. Accordingly, a tweet that gripes about the rain is as statistically valuable for predicting negative sentiment as one that complains about the price of oil or racialized terrorist threats. See Peter Dodds, et al., "Temporal Patterns of Happiness and information in a global societal network."

like Twitter, Facebook, and Snapchat to determine if sunshine and rainfall can influence the frequency of posting, interaction with posts, or the overall mood of online content.[80] One particular study, for example, from researchers at the University of California San Diego in collaboration with Facebook examines how weather events influence the spread of sentiment across social media networks.[81] The researchers ask, for instance, if rainfall in one city can impact the mood of users within a different city experiencing different weather conditions simply through social media activity. Rainfall thus is introduced as an "instrument" in variable regression, "a source of variation that directly affects the users' emotional expression" but is crucially outside the control of the experimenters.[82] Because rainfall is thought to impact emotional states but not vice versa, the weather itself serves as an experimental variable for determining how emotions spread across social networks. Through the weather, SMSA thus posits social media networks themselves as impartial and objective sociotechnical infrastructures for affective transactions.

One practical outcome of this approach to SMSA are weather-based marketing projects in which weather data is used to sell products based on social media activity. Consider, for example, WeatherAds, a "weather-based advertising platform" that allows companies to synchronize their advertisements to real-time weather events (fig. 1.3). Key to this marketing strategy is the notion that certain kinds of meteorological phenomena like rain, snow, humidity, or sunshine will inevitable lead consumers to purchase certain kinds of commodities. In this case,

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[80] Patrick Baylis et al., "Weather impacts expressed sentiment," *PLoS ONE* 13.4, e0195750 (2018): https://doi.org/10.1371/journal.pone.0195750. Aniko Hannak, et al., "Tweetin' in the Rain: Exploring Societal-scale Effects of Weather on Mood," Proceedings of the Sixth International Conference on Weblogs and Social Media (ICWSM), Dublin, Ireland, June 4-7, 2012. https://www.ccs.neu.edu/home/amislove/publications/Weather-ICWSM.pdf. Julie Jiang, et al., " Sunshine with a Chance of Smiles: How Does Weather Impact Sentiment on Social Media?," *Proceedings of the Sixteenth International AAAI Conference on Web and Social Media* (2022): 393-404.
[81] Lorenzo Covielo, et al., "Detecting Emotional Contagion in Massive Social Networks," PLoS ONE 9.3, e90315 (2014): doi:10.1371/journal.pone.0090315.
[82] Covielo, "Detecting Emotional Contagion, doi:10.1371/journal.pone.0090315.

WeatherAds enables companies to automatically produce and distribute advertisements to key social media platforms like YouTube, Facebook, and Instagram during specific kinds of meteorological conditions. For example, Coca-Cola used WeatherAds in order to target audiences around the world to buy soft drink products during "barbecue weather moments." In this campaign, WeatherAds displayed advertisements on Facebook and Instagram for Coca-Cola products only in those locations where the weather was predominately sunny and above 64º F (18º C). WeatherAds has likewise been used globally by companies such as PepsiCo, Johnson & Johnson, McDonald's, Heineken, and Goodyear.

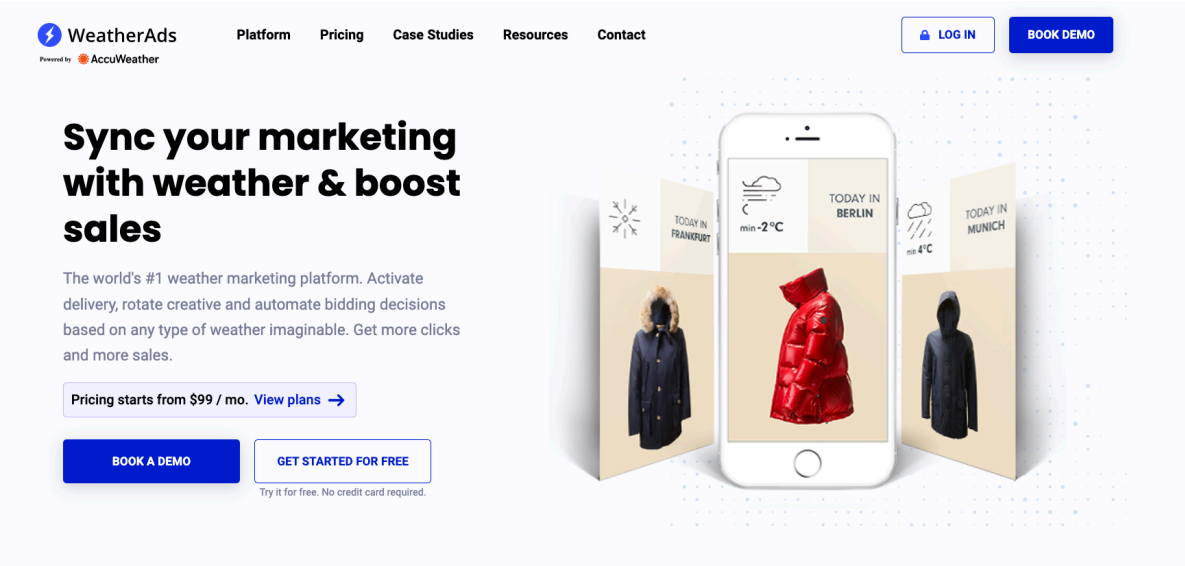


Fig.1.3: Homepage of the WeatherAds website. https://www.weatherads.io.

What such examples reveal is how the weather can be mobilized within SMSA for assessing and possibly predicting human sentiment, ultimately with the goal of increasing capital revenue within viral affect networks. However, beyond using weather data to predict sentiment, SMSA can also mobilize the weather as a proxy through which networked affect can be modeled in real-time. Such is the case for Social Doppler which similarly performs language analysis on social media activity in order to determine where and when potential customers might be susceptible to target advertising. Put differently, what makes Social Doppler a unique case to

study improxibility is how it aims to forecast sentiment *as if* it were the weather. By adopting the visual and rhetorical devices of meteorological surveillance radar, Social Doppler grafts sentiment onto the perceived systematicity and causality of the weather, sensing its structure and motion as well as its potential to trigger economic activity as it moves across urban space.

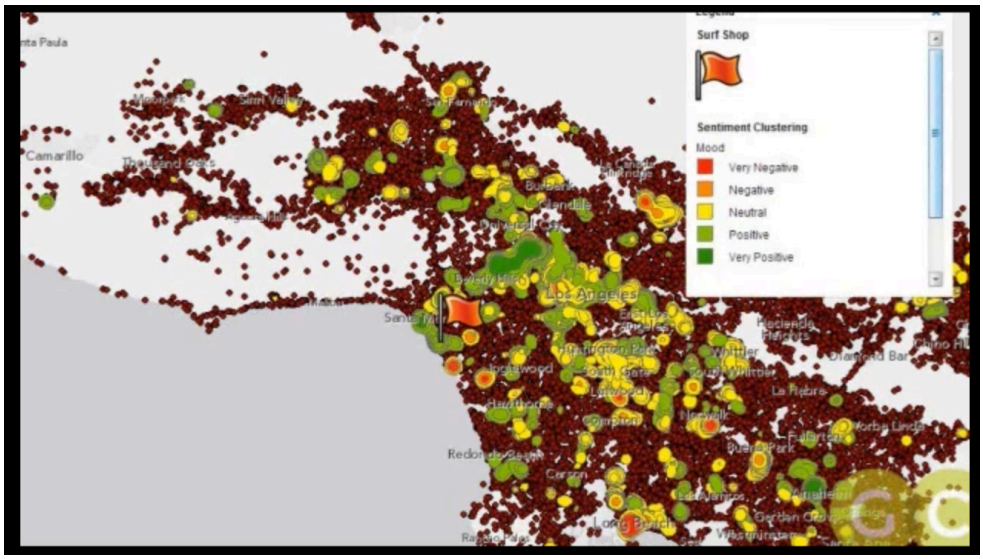


Fig. 1.4: The Social Doppler program aggregates the total number of tweets posted within a specified geographic boundary into 'mood hotspots' that indicate the relative sentiment of people at specific moments in time. Screenshot of Geographic Communication Systems webinar by author.

As practice of SMSA, Social Doppler claims to predict and modulate economic utility by treating social media text as a proxy for perceived sentiment. In their example, a surf shop in Venice Beach is interested in using geospatial location analytics to improve the return on their advertising. After culling social media posts uploaded within a given diameter across western Los Angeles, Social Doppler applies a "continuous cascading analytic" to extract negative and positive sentiment using language parsing algorithms common to other SMSA studies. The program then combines various non-spatial datasets (census data, income levels, perhaps weather data) with spatial location analytics using clustering algorithms to normalize among numerous data points, thus producing mood hotspots (fig. 1.4). Clustering algorithms produce assemblages

of data through homophily.[83] As the Social Doppler team remarks, clustering establishes equivalences among individual sentiment scores by "correlating what's being said, when it's being said, where it's being said." Clustering further allows for Social Doppler to chart how moods shift over time, building in intensity or dissipating like scattering clouds. (fig. 1.5). In this case, Social Doppler is less interested in identifying which moods are susceptible to targeted advertisements than producing populations for targeted advertising based on their susceptibility to preexisting affects that crawl over urban space.


Fig. 1.5: By mapping 'mood hotspots' over time, Social Doppler can map sentiment like a weather system, thus allowing business to locate potential customers for targeting advertising. Screenshots of Geographic Communication Systems webinar by author.

[83] Homophily is the axiom in network science that similarity breeds connection. If two data points seem similar, then they must be the same. Importantly, homophily is the basis by which algorithms not only cohere networks, but also discriminate what belongs and what doesn't. See Chun, *Discriminating Data*.

Like in HunchLab, the weather proxy produces ubiquity effects within the predictive marketing techniques of Social Doppler. As a modeling tool, the weather disaggregates emotion from the body, instead emerging as an autonomous system beyond human design. Anyone who finds themselves in a particular mood hotspot will inevitably desire a particular commodity. In addition, the weather justifies the continued conscription of environmental deferral in big data computation. Because sentiment spreads in ways that we cannot control, whatever differentiating characteristics might be computed for a given population are only the effect of preexisting mood vectors sensed in real-time. For Social Doppler, economic utility is a quantifiable characteristic for population analysis because sentiment itself is an objectively verifiable property of the environment. Taken together, Social Doppler's invocation of the weather as a ubiquitous medium for surveillance reveals how proxies are not simply technical relations within algorithmic systems to predict behavior, but also aesthetic forms that produce particular sensemaking schema through which the social becomes legible within computational systems. And it is here in the aesthetics of proxies where can witness how improxibility, as a digital logic in big data predictive analytics, operates as a form of algorithmic governance that engineers populations to conform to statistical correlations of data.[84] The social becomes operable *as if* it were the weather.

By conjuring the weather as a proxy to visualize and monetize sentiment, Social Doppler further clarifies how proxies reanimate and transform nineteenth century sentimental modes of biopower through improxibility. As Kyla Schuller documents, "nineteenth-century biopower consolidated in a sentimental mode that regulated the circulation of feeling throughout the

[84] Here I understand improxibility to perform what Tony Sampson calls the "engineered cultural virality" of network infrastructures. Tony Sampson, *Virality: Contagion Theory in the Age of Networks* (Minneapolis: University of Minnesota Press, 2012), 65.

population and delineated differential relational capacities of matter, and therefore the potential for evolutionary progress, as the modern concepts of race, sex, and species."[85] Climatic determinists like Dexter understood this well. Through impressibility, the weather orchestrated an uneven distribution of somatic vulnerability that bound bodies together within population groups marked by specific identity categories. Biopower transformed the body's relational capacity into a means by which to ascertain those groups whose existence would contribute to the biological and economic stability of the national population and those who would not. In like manner, Social Doppler attests to the ways in which improxibility and biopower become synonymous insofar as the weather systematizes a repertoire of sentiments that produce, in Schuller's words, "atmospheres in which people come to identify with the needs of the state and capitalism as their own best interests."[86] However, as opposed to earlier versions of climatic determinism that defined sentiment through neurological and emotional tendencies that situated the individual within a biological population, Social Doppler extracts and models affect through proxies, not the body. It is not the affective capacity of the body that binds together populations, but rather the technical form of the proxy itself that is expressive of how data becomes susceptible to the grammar of correlation. Within Social Doppler, biopower consolidates at the site of the proxy's relational capacity to draw equivalence between the consumer, social media activity, and optimal utility within weather maps of sentiment.

And yet, as in the case of HunchLab, the ability to predict population behavior through the weather operates upon a fundamental technical relation of social difference.
Social Doppler's goal is to increase sales for local vendors by projecting which kinds of consumers are most vulnerable to targeted advertising. However, the program determines such

[85] Schuller, *The Biopolitics of Feeling*, 5.
[86] Schuller, *The Biopolitics of Feeling*, 19.

utility scores based on the frequency and proximity of terms in text-based parsing algorithms, not self-reported feelings from individual consumers. Via clustering, these values are normalized to measure patterns of affective intensity within a confined geospatial region that represent the overall sentiment of all nearby consumers. Utility hotspots replace the racial and class makeup of Venice Beach, as well as surrounding regions like Santa Monica and Ocean Park that are majority white and upper class. Even individual indicators of utility, including use and access to social media, smartphones, and transportation, are subsumed by the post-identity parameters of probabilistic computation—parameters designed to maximize profit and nothing else. Viable consumers are thus identified from a pre-selected population that already lies adjacent to capitalist concepts of regeneration and vitality. If improxibility produces ubiquity effects for predictive analysis, it is only because social difference, on a technical level, already frames the relational capacity of proxies to cohere populations through patterns of statistical correlation.

*Improximating Climate Change*

Ever since the weather has been a site of prediction, it has also been the fantasy of control. From religious myths to speculative fiction, humans have long desired to alter weather phenomena in order to create more habitable environments for living or for exercising power.[87] Now, in the twenty-first century, such fantasies have taken on new momentum to abet the deleterious effects of anthropogenic climate change. While mainstream efforts to address the climate catastrophe include practices like sustainable energy, novel weather control techniques are as curious as they are varied: using solar shields to shade the planet, planting massive forests

[87] James Rodger Fleming, *Fixing the Sky: The Checkered History of Weather and Climate Control* (New York: Columbia University Press, 2010). Kristine Harper, *Make It Rain: State Control of the Atmosphere in Twentieth-Century America* (Chicago: University of Chicago, 2017).

of artificial trees to moderate carbon dioxide, and emitting sulphates into the atmosphere to create new aerosol-radiation interactions from artificial clouds. Should such techniques of geoengineering come to pass, those in control will determine what climatic milieus are salvageable and which are not. As poor and previously colonized nations in the Global South stand to suffer the consequences of a changing global climate, weather modification is poised to become a new site of disaster capitalism.[88] Campaigns like Data for Climate Action from the United Nations Global Pulse, for example, promise big data as a means to solve global climate crises only to generate value for participating corporations through their ability to monetize data from users.[89]

For the moment, such large-scale fantasies of weather modification are unattainable. And yet, they are important nonetheless as orienting fictions of ubiquitous surveillance that allow us to grasp the potential technological, political, and ecological transformations at stake in the proxy within big data predictive analytics. If the weather is predictive, controlling it might allow one to change the future. Artist James Bridle offers one such speculative vision in his project *Cloud Index* (2016). Correlating over 15,000 satellite images of weather patterns with seven years of polling data, *Cloud Index* uses neural networks to predict how the population of the United Kingdom would vote in the 2016 European Union membership referendum depending on various cloud coverage scenarios. Through a series of simulations, the project demonstrates that, for example, increased cloud levels correlate with "Remain" polling while clear skies lead to "Leave" polling. At work here is a fantasy of ubiquitous surveillance in which the weather proxy

[88] Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism* (New York: Metropolitan Books, 2007); Robert Fletcher, "Capitalizing on Chaos: Climate Change and Disaster Capitalism," *ephemera* 12.1/2 (2012): 97–112.
[89] Maria Espinoza and Melissa Aronczyk, "Big data for climate action or climate action for big data?," *Big Data & Society* (2021): 1-15, https://doi.org/10.1177/205395172098203.

is intentionally manipulated in order to obtain certain desirable outcomes within big data predictive models. As Bridle quips, "These are dreams of the weather, hallucinated by machines. If we wish to change the future, we must change the weather."[90] Indeed, it is not too much of a stretch to imagine corporate, federal, or military entities dreaming up weather modification systems in order to conjure storms in certain geographic regions because a big data firm like Cambridge Analytica predicted through a SMSA program that high winds will yield specific voting patterns in a coming election. Through improxibility, big data thus offers an extraordinary rendition of ubiquity: to be on this planet with these cosmological circumstances is to be already susceptible to a racializing risk calculus that maintains dominant economic and political systems of power.

But what might we encounter with the winds of change? As the global climate shifts, so too will long-term averages in temperature, barometric pressure, and rainfall. What improxibility lays bare is how such changes in the climate could also disturb the ability for big data programs to use weather data to predict future behavior. Insofar as big data programs suture behavior to preconceived models of weather systems, any changes in those systems could also impact how proxies are able to establish relationships in predictive analytics. For example, if SSC now uses past data on windspeed to model aggravated assault, sudden changes in the weather could dislocate the environmental context within which such proxies operate. What we thus find here in the strange folds of improxibility is how our anxieties about climate change are tied up with a white liberal imaginary in which unforeseen meteorological shifts could result in the inability to, say, police poor communities of color or ensure the proper flow of capital within middle and upper class economies. Taking this logic to its extreme, climate change thus stands to threaten

[90] James Bridle, "Cloud Index," 2006, https://cloudindx.com. For more on climate science and weather modification, see James Bridle, *New Dark Age*.

the social order in which proxies reanimate the ideological vestiges of climatic determinism to justify the continued subjugation of racialized communities as buffers to protect white civil society from the violences of the planet.[91] To be clear, I'm not advocating here for a kind of accelerationism, as if a more intense rate of global warming might precipitously unsettle the chains of sovereignty that grip big data predictive analytics. Rather, improxibility reveals that as much as climate change is a crisis of the environment that forces us to reconcile with the ecological impacts of our political, social, and economic infrastructures, it is also a crisis of the digital and its ability to give form to the social. If proxies like weather data can be used to secure the future for the status quo, they also reveal the correlative fault lines that course through our imaginaries of ubiquitous surveillance.

[91] Kathryn Yusoff, *A Billion Black Anthropocenes or None* (Minneapolis: University of Minnesota Press, 2018), xii-xiii.

## CHAPTER 2

Retrospecting Genetics: On the Aorist in DNA Phenotyping

In 2015, *Paper Magazine* approached artist-scholar Heather Dewey-Hagborg to create a "DNA portrait" of the American whistleblower Chelsea Manning. Manning rose to prominence in the early 2010s for disclosing to WikiLeaks nearly 750,000 classified or sensitive documents relating to the US occupation of Iraq and Afghanistan which resulted in her being convicted in 2013 for violating the Espionage Act (among other charges). At the time she was contacted by Dewey-Hagborg, Manning was incarcerated at the United States Disciplinary Barracks in Fort Leavenworth, Kansas. She had also recently began publicly identifying as a trans woman the day after her sentencing.[1] However, due to strict policy from the prison (which is a men's facility), Manning had little access to visitors and no images of her were allowed to circulate. As a result, media coverage of the Manning case continually used either an older image of her in military apparel or a grainy black-and-white selfie that Manning took of herself wearing a wig which she had previously sent to her therapist and commanding officer in a private email in 2010. Neither of these images were approved by Manning for circulation in public channels. The point, then, of the DNA portrait was to provide Manning a means of visibility in order to combat transphobic discourses in national media coverage.[2] As Manning states in a 2016 interview, the DNA portrait aimed to give her visibility in a system which denies visibility, especially for trans people: "Our society's dependence on imagery says a lot about our values. Unfortunately, prisons try very hard

[1] Evidence suggests that Manning identified as trans prior to this announcement public announcement within her close network of acquaintances. See Dean Spade and Craig Willse, "Sex, Gender, and War in the Age of Multicultural Neoliberalism," *QED: A Journal in GLBTQ Worldmaking* 1.1 (2014): 5-29.

[2] In addition to Dewey-Hagborg's DNA portrait, there were other efforts to provide a gender-confirming image of Manning. Most notable among them is Alicia Neal's portrait of Manning titled *How Chelsea Manning sees herself*, which was made in cooperation with Manning and commissioned by the Chelsea Manning Support Network in April 2014.

to make us inhuman and unreal by denying our image, and thus our existence, to the rest of the world. Imagery has become a kind of proof of existence. Just consider the online refrain 'pics or it didn't happen.'"[3]

To create the portrait, Dewey-Hagborg deployed a technique of genetic surveillance called DNA phenotyping. Also known as molecular photofitting, DNA phenotyping is the practice of using forensic genetic tools to predict phenotype (an individual's physical appearance) from genotype (an individual's genetic makeup). As defined by molecular biologist Manfred Kayser and evolutionary geneticist Peter de Knijff, DNA phenotyping is "the inference of information on biogeographic ancestry and EVCs [externally visible characteristics] directly from a DNA sample."[4] First, Manning sent the artist saliva and hair samples from which she extracted and analyzed DNA for a range of genetic markers associated with phenotypic characteristics. Next, through Basel Face Model—an open-source Matlab model normally used for 3-D facial recognition—she reconstructed Manning's face using a heat mapping system to organize the genetic information within a facial morphology parameterized according to gender, height, weight, and age. Crucially, however, Dewey-Hagborg decided not to profile Manning's DNA for genetic sex. As she later recalled in a 2017 lecture on her art practice, "[Manning] was worried about appearing too masculine and I thought her portrait provided a perfect way to call attention to the shortcomings of DNA phenotyping, which relies on stereotyped ideas of what different kinds of faces are supposed to look like—including sex."[5] Instead, by removing analysis of genetic sex, Dewey-Hagborg created multiple versions of Manning's face before

[3] Cory Doctorow, "Chelsea Manning interview: DNA, big data, official secrecy, and citizenship," *Boing Boing*, January 25, 2015, https://boingboing.net/2016/01/25/chelsea-manning-interview-dna.html.
[4] Manfred Kayser and Peter de Kniff, "Improving human forensics through advances in genetics, genomics and molecular biology," *Nature* 12 (2011): 182.
[5] Heather Dewey-Hagborg, "Hacking Biopolitics," *e-flux* (Feb 2017): https://conversations.e-flux.com/t/heather-dewey-hagborg-hacking-biopolitics/6045.

choosing one that she found the most compelling. She then produced two versions of that face, one that is feminine and the other gender neutral according to the face mapping system. The faces were embellished with externally visible characteristics gleaned from Manning's genetic profile, like eye color and skin color, and sent to a 3-D printer to create life-size models. The resulting portraits, titled *Radical Love: Chelsea Manning* (2015), were published in an issue of *Paper Magazine* while the 3D prints were displayed at the World Economic Forum in January 2016 (fig. 2.1).

Fig. 2.1: The two 3D printed DNA portraits from Dewey-Hagborg's *Radical Love: Chelsea Manning* (2015). On the left is the gender-neutral version and on the right is the feminine version. Used with permission from artist.

Preceded by the development of DNA profiling techniques in the latter half of the twentieth century, DNA phenotyping was properly introduced for the first time in the early 2000s largely in the context of the criminal justice system. Contracting companies like Parabon NanoLabs, Illumina, and Identitas, forensic investigators and the police turn to DNA phenotyping to produce digitally-rendered composite portraits of suspects as well as information about their race, ethnicity, and ancestry. And yet, despite its growing popularity, DNA phenotyping has become subject to widespread critique within the scientific community and is

often labeled as a pseudoscience by the popular press.[6] Central among these censures is how DNA phenotyping gives lie to the notion that most, if not all, externally visible characteristics can be causally determined through genetic analysis. While a few characteristics like eye color, hair color, and freckling have been casually tied to specific genetic sequences, features like facial morphology and skin tone are far too complex to map onto specific parts of the genome. Meanwhile, race and ethnicity, as social constructs, cannot be pinned down to genetic data. Such issues are at the heart of *Radical Love*, which interrogates popular and scientific assumptions that physical appearances are genetically determined, and moreover that techniques for rendering faces from DNA are objective and neutral. By using techniques of DNA phenotyping to reconstruct two different iterations of Manning's face, Dewey-Hagborg instead reveals the inherent multiplicity and ambiguity that underlies genetic prediction tools and how such tools inevitably fail to capture the full extent of one's identity beyond genetic material. At the same time, she reveals the dark side of the surveillance technology—that DNA phenotyping can produce any-face-whatever for forensic investigations. We might imagine, for example, that a company like Parabon could create any possible face needed to corroborate eyewitness accounts in a criminal case, which could then potentially facilitate racial and sexist profiling.

My interest in DNA phenotyping stems from how it stages the politics of ubiquity within contemporary surveillance culture through the medium of DNA. On the one hand, DNA itself, colloquially called the "code of codes" and the "blueprint," emerges as an omnipresent, objective, and universal biological site for predictive surveillance. Indeed, the purported success of DNA phenotyping relies in part on the fact that every human has DNA. Thus, DNA phenotyping—unlike other kinds of biometric surveillance systems like iris scanners, gait

[6] Heather Zeiger, "China: DNA Phenotyping Profiles Racial Minorities," *Mind Matters*, December 26, 2019, https://mindmatters.ai/2019/12/china-dna-phenotyping-profiles-racial-minorities.

trackers, and voice recognition software—can be universally applied to any given criminal investigation since it is not contingent on the suspect's alignment with normative standards of bodily ability.[7] As long as the DNA recovered from a crime scene has not been degraded to a significant degree, it can be used to produce a predictive portrait. Moreover, DNA phenotyping takes advantage of how, on a molecular level, humans are virtually identical. Following the completion of the Human Genome Project in 2003, scientists confirmed that of the three billion nucleotide bases that make up the human genome, 99.9% percent are the same in every person.[8] The remaining difference is responsible for all observable variation in humanity, including physical differences. This small amount of variation is crucial in criminal forensics not only for determining whether two DNA samples might have come from the same individual, but also for building predictive models of phenotypic features based on similarities in key genetic sequences.

Taken together, the medial effects of ubiquity produced by DNA phenotyping revolve around two poles of genetic surveillance: on the one hand, the universalism of DNA itself, in which genetic material can potentially belong to anyone; and on the other hand, the specificity of DNA, in which genetic information can pinpoint a single individual with unique phenotypic characteristics. In the middle of these we find the specific technological processes of prediction within DNA phenotyping which maneuvers itself within the gap between genotype and phenotype, the universal and the specific, the DNA sequence and the face. What's crucial here is how DNA phenotyping binds together genotype and phenotype using probabilistic statistical models that enable machine learning systems to create composite portraits. However, through

[7] On the discriminatory effects of biometric technologies, see: Shoshana Magnet, *When Biometrics Fail*; Natasha Saltes, "'Abnormal' Bodies on the Borders of Inclusion: Biopolitics and the Paradox of Disability Surveillance," *Surveillance & Society* 11.1-2 (2013): 55-73.
[8] Francis Collins and Monique Mansoura, "The Human Genome Project: Revealing the shared inheritance of all humankind," *Cancer* 91.S1 (2001): 221-225.

such methods, DNA phenotyping opens up DNA to its multiplicity, thus becoming susceptible to producing the any-face-whatever on display in Dewey-Hagborg's art practice. In this sense, I argue that the medial effects of ubiquity in DNA phenotyping stem from the specific technological and aesthetic forms of data-driven processing that underlie its predictive models of facial morphology. By allowing enough ambiguity within the relationship between genotype and phenotype, DNA phenotyping stages ubiquity as the potential to produce any face possible while also still being grounded within the objective claims of genetics.

To be clear, in exploring the ubiquity effects of DNA phenotyping, I'm less interested in proving the inaccuracy of the technology or demonstrating its ethical implications, a topic which has been covered by biomedical and legal experts.[9] Nor do I intend to claim that the use of DNA itself in forensics investigations is inherently problematic. Initiatives like the Innocence Project—which provides access to post-conviction DNA testing to exonerate individuals (mostly people of color) wrongfully sentenced in a criminal case—show how DNA can be used for social justice rather than dubious forms of predictive discrimination. My investigation of DNA phenotyping instead concerns the predictive techniques for making DNA legible within preexisting regimes of identity that give license to the authority of surveillant power. Such power I argue is not simply located in DNA itself nor in the forms of social recognition that enable racial profiling, but in the contingent ways in which phenotype is assembled through medial practices of data-based computation. At stake here is how social difference itself is abstracted and reconstructed within heatmap systems which purport to make identity visible within received frameworks of racial and gendered embodied concretized within the face.

[9] Sheldon Krimsky and Tania Simoncelli, *Genetic Justice: DNA Data Banks, Criminal Investigations, and Civil Liberties* (New York: Columbia University Press, 2011).

In this chapter, I track the ubiquity effects of DNA phenotyping through the technical processes by which genetic information is translated into composite portraits. It begins with an overview of the genetic basis of DNA phenotyping, its development for use in criminal investigations, and its potential for racial profiling. In particular, I focus on how DNA phenotyping uses machine learning methods to infer racial difference from an individual's biogeographic ancestry, or the estimation of the continental regions where one's ancestors originated. What's important here is how race is framed as the retrospective search for a buried ancestral past within genetic material—a past which was never lived, but one that can seemingly be useful for generating a composite portrait. In order to account for these temporal logics of retrospection, the latter half of this chapter takes up the concept of the aorist, a grammatical aspect that indicates a past event without reference to an exact time or completeness of action. In the 1990s, the aorist was adopted within the information sciences as a method of temporal analysis to predict past events within an unspecific timeframe, such as in modeling past crimes within predictive policing software. While computational research at the time warped the original meaning of the aorist within linguistics, I nonetheless pursue the term as a conceptual form that can help clarify how DNA phenotyping constructs digital faces through the construction of an unlived genetic past. In this case, I see the aorist as a particular mode of retrospection that treats the past as a series of weighted probabilities that can be used for predictive purposes. Analyzing genetics research and publicity materials from the company Parabon NanoLabs, I show how the aorist subtends the statistical models that enable the production of composite portraits through heat map systems. And in the final section, I return to Dewey-Hagborg's artwork to consider how it stages the aorist as a key temporal form through which the neoliberal security state constructs identity within biometric surveillance systems.

Ultimately, the aorist brackets how DNA phenotyping maintains claims to ubiquity by opening up the past as a contested site of power that puts pressure on future-oriented forms of prediction that saturate surveillance culture.

*The Racial Politics of DNA Phenotyping*

Since the 1990s, DNA has been summoned as a so-called "silent witness" in the courtroom to help solve criminal investigations. Whereas eye witnesses are susceptible to false reporting and loss of memory, DNA is regarded as impartial, infallible, and reliable—so much so that it overrides other pieces of evidence in the formation of a verdict.[10] For the most part, DNA is employed to confirm one's identity. Forensic scientists analyze genetic material recovered from a crime scene (like hair, blood, and semen) in order to match it to the genetic material from potential suspects. This might also involve comparing recovered DNA to genetic profiles within national forensic databases like Combined DNA Index System (CODIS) which maintain records of all known criminal offenders. Matches are determined if there is a strong correlation in the genetic material among a number of specific loci of alleles called short tandem repeats (STR). STRs are known to encode the most unique aspects of an individual within the human genome since they have higher rates of mutation than other areas of DNA. Through processes of genetic profiling, police, scientists, and courts are thus able to positively identify suspects by singling them out of a population, in turn putting a name to a DNA profile.

Since the beginning of the twenty-first century, however, forensic genetics looks much different. As anthropologist Amade M'charek observes, while conventional DNA profiling techniques are primarily an "identification technology" that match genetic material to known

[10] Krimsky and Simoncelli, *Genetic Justice*, xv.

criminal databases, "by the end of the 20th century [DNA] had also become a preferred tool in the criminal investigation process, aimed at generating a suspect."[11] The shift from identifying a suspect to generating one is emblematized in the practice of DNA phenotyping. While DNA profiling involves positively identifying a suspect by determining their genetic makeup, DNA phenotyping instead involves the prediction of phenotyping traits from one's genetic profile. The first commercial DNA phenotyping product was DNA Witness from the company DNAPrint Genomics, founded in the early 2000s by scientist Tony Frudakis. Using methods of forensic analysis to isolate specific nucleotide pairs within the sample DNA, DNA Witness promised to provide criminal investigators with a genetic profile of a suspect. At the time, this profile was limited to information about the sex and biogeographical ancestry of the individual, along with the color of their eyes and hair. DNA Witness was famously used for the first time in 2004 to convict the so-called Baton Rouge serial killer.

More contemporary iterations of DNA phenotyping, however, go beyond merely identifying phenotypic traits and categorizing the suspect among racial and ethnic groups. Instead, they attempt to analyze particular aspects of one's genetic material to create predictive portraits of the individual, complete with phenotypic traits like hair color and skin color as well as facial morphology. This technique was popularized with the forensic genetics product Snapshot by Parabon NanoLabs According to Parabon's Director of Bioinformatics Ellen Greytak, Snapshot is "the world's first software application able to predict the ancestry and physical traits, including face shape, of an unknown person from simply a DNA sample."[12]

[11] Amade M'charek, "Beyond Fact or Fiction: On the Materiality of Race in Practice," *Cultural Anthropology* 28.3 (2013): 427.
[12] Ellen Greytak, "Advancing Forensic DNA Analysis in Support of DoD Missions," presented at the Homeland Defense and Security Information Analysis Center, May 21, 2020, https://www.youtube.com/watch?v=-XmMQB68CrI.

Released in 2014, Snapshot was funded by the Department of Defense, which initially wanted to develop DNA phenotyping technology in order to identify enemies in the theater of war, especially through genetic material left on unused explosives.[13] What makes Snapshot unique is how it frames DNA phenotyping as a machine learning exercise to produce predictive portraits. Snapshot works by training machine learning algorithms upon a large corpus of DNA samples from volunteers to isolate correlations among genetic sequences that describe particular phenotyping traits. The result are predictive models of particular traits to which DNA recovered from a crime scene can be compared to yield statistical predictions of the likelihood that the individual has a certain eye, skin, and hair color. In order to produce the composite portrait, the system combines facial scans of DNA donors from its database that are most genetically similar to the unknown suspect in terms of sex and ancestry. Externally visible phenotypic characteristic are then applied to the face, as well as other physical features like facial hair, scars, and accessories if there are corroborating eyewitness accounts. In addition, each predictive portrait is by default rendered to be twenty-five years old with an average body mass index. Snapshot was first used in 2015 to produce a "DNA police sketch" for a double homicide cold case from 2011. The resulting profile features a generic digitally-rendered portrait of a young African American male with associated percentage indicators of ancestry, skin color, eye color, hair color, and freckles (fig. 2.2).

[13] Carrie Arnold, "Crimefighting with Family Trees," *Nature* 585 (2020): 178-181.

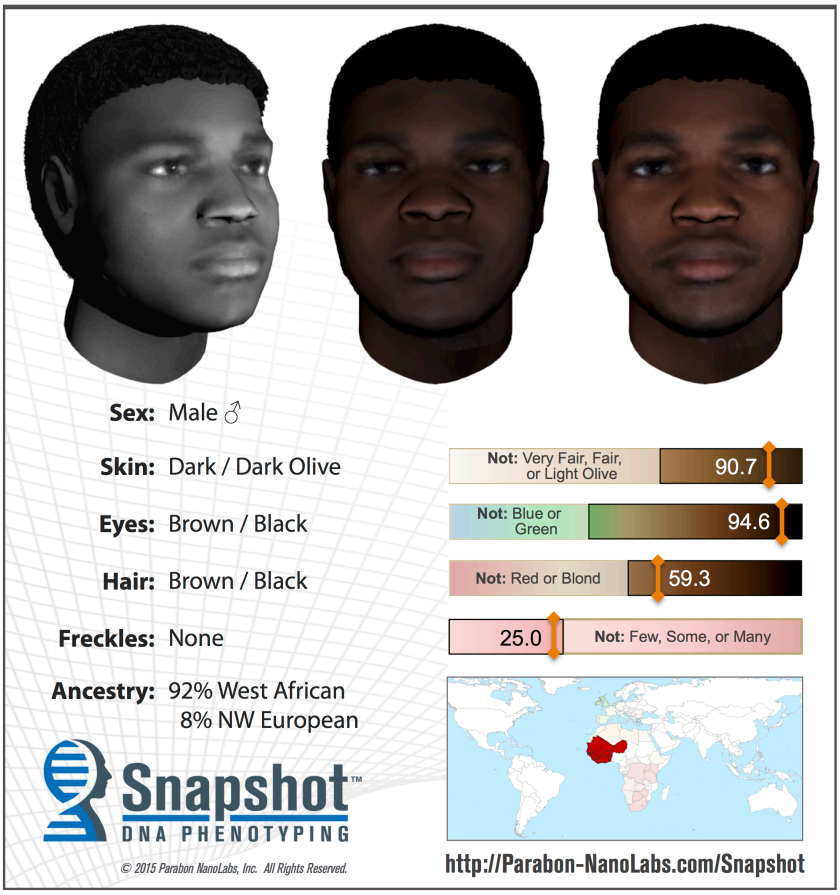


Figure 2.2: The first case in which Parabon's Snapshot was used to produce a predictive composite portrait of an individual's face based on DNA left at a crime scene. From https://parabon-nanolabs.com.

DNA phenotyping has stirred disputes within molecular biology and genetics research communities since the beginning of the twenty-first century, primarily because its predictive portraits suggest a direct causal link between genotype and phenotype. However, for the most part, only very few phenotypic traits can be positively linked to specific genetic loci. For example, hair color, eye color, and freckling are determined by analyzing single nucleotide polymorphisms, or SNPs. SNPs are unique variations at a single position in a DNA sequence caused by differences in one nucleotide base. At a non-SNP site, every person will have the same nucleotide base, but SNP bases will vary among individuals (for example, a SNP may replace guanine with adenine in a certain stretch of DNA). While many specific SNPs might occur in

noncoding regions of DNA, some importantly do occur in regions that will be transcribed into proteins, which means that they can be relevant for determining hereditary genetic information. As such, SNPs are most useful for predicting certain traits like susceptibility to human diseases or, in some cases, externally visible characteristics like eye and hair color.

However, not all phenotypic traits can be predicted with SNPs. Many (if not most) traits are polygenic, meaning that they are produced from many different genes in various loci of the human genome. In addition, as epigenetics research has shown, many other kinds of gene activity and expression are impacted by external and environmental factors, thus making it difficult to know with any degree of certainty that a genotypic profile will result in any specific set of externally visible characteristics. Perhaps the most notorious polygenic trait is skin color, which has long played a central role in criminal profiling even prior to advances in DNA phenotyping. However, despite the fact that skin pigmentation is not linked to a specific SNP, many DNA phenotyping processes like Snapshot nonetheless attempt to determine this trait from genotype. To do so, forensic geneticists turn to biogeographic ancestry. In his 2008 textbook *Molecular Photofitting: Predicting Ancestry and Phenotype Using DNA*, Frudakis advocates for using "ancestry as a proxy for the net effect of the character of [phenotypically functional] loci in individuals, and we do so based on the observation that phenotype character is distributed to a certain but quantifiable extent as a function of ancestry."[14] In this case, skin pigmentation is indirectly inferred from ancestry, rather than directly and casually measured through SNPs. Similarly, in their review on DNA phenotyping, Peter Schneider, Barbara Prainsack, and Manfred Kayser write that although "biogeographic ancestry does not in any way correspond to such concepts as ethnic origin or 'race,'" nonetheless "certain externally visible characteristics

[14] Tony Frudakis, *Molecular Photofitting: Predicting Ancestry and Phenotype Using DNA* (Cambridge: Academic Press, 2008), 429.

depend on biogeographic ancestry," such as "blond hair, blue eyes, and light skin [which] are always at least partly of European ancestry."[15] The fundamental assumption behind these statements is that even if race and ethnicity don't necessarily equate to biogeographic ancestry, skin pigmentation is still homogenous across ancestral groups, which to some extent maps onto contemporary racial categories.

While biogeographic ancestry cannot directly predict an individual's race or skin color, lead developers of commercial DNA phenotyping claim that statistical estimates of biogeographic ancestry based on population-wide studies (barring their reported accuracy) can be useful for forensic investigations. In a *Nature Genetics* review published in 2005 following the introduction of DNA Witness, Frudakis argues alongside population geneticist Mark Shriver and FBI senior scientist Bruce Budowle that "the use of population categories in forensic science has been based on a pragmatic need to obtain allele frequencies for computing profile probabilities."[16] Key here is the claim that DNA phenotyping can reasonably employ population-level analysis of ancestry to predict skin color because the analysis of DNA left at a crime scene is conducted based on its statistical similarity to DNA samples which have been demonstrated through scientific research to encode information about biogeographic ancestry. In this case, biogeographic ancestral analysis is not a limitation to predicting phenotype, but instead a productive variable insofar as it enables researchers to refocus efforts based on scientifically-driven methods of forensic analysis conducted upon populations of genetic information. For

[15] Paul Schneider, Barbara Prainsack, and Manfred Kayser, "The Use of Forensic DNA Phenotyping in Predicting Appearance and Biogeographic Ancestry," *Deutsches Ärzteblatt International* 116 (2019): 877, 879. For a more thorough discussion of the way that molecular biology has fastened genetic differentiation to racial types based on continental ancestry, see Deborah Bolnick, "Individual ancestry inference and the reification of race as biological phenomenon," in *Revisiting Race in a Genomic Age*, ed. Barbara Koenig, Sandra Soo-jin Lee, Sarah Richardson, 70-85 (Brunswick, NJ: Rutgers University Press, 2008).
[16] Mark Shriver, Tony Frudakis, and Bruce Budowle, "Getting the science and the ethics right in forensic genetics," *Nature Genetics* 37.5 (2005): 449.

some advocates of DNA phenotyping, the use of population-level analysis to determine biogeographic ancestry ultimately means that it is thus primarily an "investigative tool" rather than an instrument of identification that simply aims to determine the race or ethnicity of a specific person.[17]

Following such reports, forensic geneticists like Frudakis defend DNA phenotyping as an unbiased technology for genetic surveillance that merely makes visible what is latent in genetic material. This claim is often leveraged to protect the practice from accusations of racial discrimination, particularly when used in the service of policing. To be sure, such claims are not unique to DNA phenotyping, but instead stem from certain post-racial imaginaries of genomic science that emerged in the latter part of the twentieth century, most famously represented by the 1950 UNESCO Statement on Race, which formally called for an end to scientific racism. And yet, as historians of science note, while the UNESCO Statement mobilized biology to prove the "meaninglessness of race," it in turn reproduced racial taxonomies in a way that extended geneticists' control over how race can and should be defined.[18] Similarly, despite claims that genetic analysis would obviate discrimination, DNA phenotyping produces predictive portraits by analyzing DNA for traces of biogeographic ancestry, which allows for the inference of skin color and race. In this case, DNA phenotyping nonetheless abides by certain normative scripts of racial difference, now purportedly encoded in DNA, in order stabilize a suspect's identity.

[17] Schneider, Prainsack, and Kayser, "The Use of Forensic DNA Phenotyping in Predicting Appearance and Biogeographic Ancestry," 875.
[18] Jenny Reardon, "Decoding Race and Human Difference in a Genomic Age," *differences* 15.3 (2004): 40. See also: Elazar Barkan, *The Retreat of Scientific Racism: Changing Concepts of Race in Britain and the United States between the World Wars* (Cambridge: Cambridge University Press, 1992).

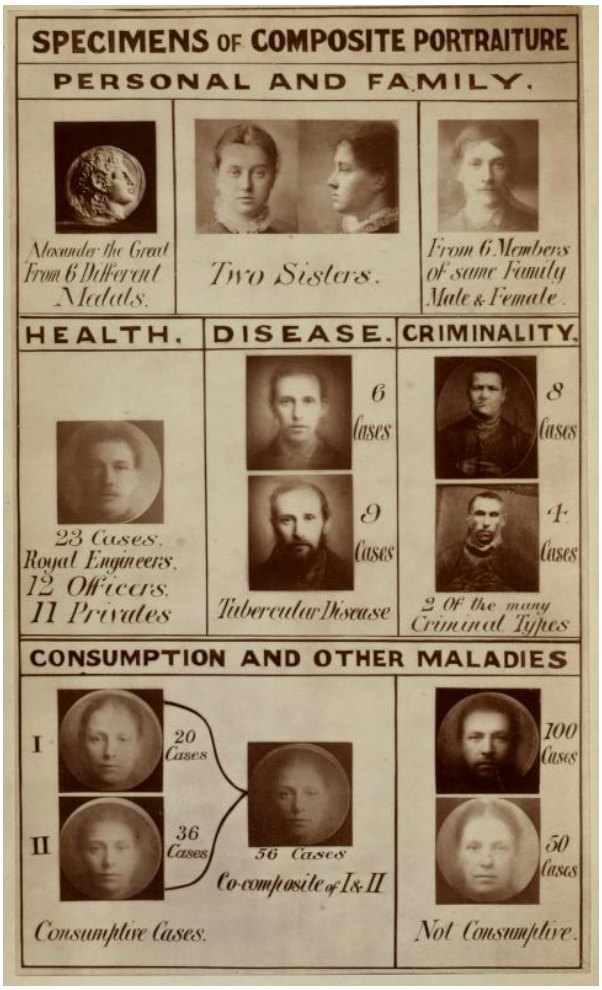


Fig. 2.3: Frontispiece from Francis Galton's 1883 publication *Inquiries into human faculty and its development* demonstrating his technique of compositing photographic portraits in order to reveal a general "type" of individual.

The discriminatory potential of DNA phenotyping has not gone unnoticed. Of primary concern here is how DNA phenotyping risks enabling racial profiling in policing despite claims from developers that it does not discriminate based on race. Indeed, as an investigative tool, DNA phenotyping must be subject to interpretation and bias. This is as much a concern that arises from the use of biogeographic ancestry to infer skin color as the way that digital composite images produced from genetic material circulate as possible portraits of criminal suspects. As Ruha Benjamin contends, such images are but the latest entry in a much longer visual archive of racial representations and genealogy of biometric technologies that have long structured modern policing practices as well as systems of chattel slavery and eugenics in colonial and imperial

regimes.[19] Most immediately, Parabon's computer-generated portraits bear an uncanny resemblance to the composite portraits made by Francis Galton in the late nineteenth century in his effort to visualize the statistical nature of hereditarian laws to construct a perfect eugenicist state. In Galton's practice, composite portraiture transformed the specificity of the individual—encased in the photographic index—into a nonspecific and abstract image that could serve as the symbolic representation for a broader population (fig. 2.3).[20] In much the same way, DNA phenotyping constructs composite portraits by comparing DNA recovered from a crime scene with genetic profiles stored in a database based on predetermined geographic ancestral groupings. In turn, M'charek suggests, DNA phenotyping is "not so much aimed at the *individual suspect* but at a *suspect population*," insofar as it "produces a composite face of a collective, one that can direct the police investigator to focus on some groups of people in the population and not others."[21] If we are to understand DNA phenotyping as predictive, it is thus not only because it infers the race of a suspect, but also because it "gives officers license to suspect anyone who fits the generic description of the image."[22] For this reason, scientists and legal experts warn that such techniques offer police and courts incorrect assumptions about population-level analyses of ancestry, which in turn might lead to dragnet operations targeting suspects of a specific racial of ethnic identification.[23]

Such critiques are apt for describing how racial difference inflects composite portraits in DNA phenotyping, and further how those images can be broadly (mis)interpreted by criminal

[19] Benjamin, *Race After Technology*, 122.
[20] As Alan Sekula famously argues, composite portraiture "attempted to elevate the indexical photographic composite to the level of the *symbolic*, thus expressing a *general law* through the accretion of contingent instances." Alan Sekula, "The Body and the Archive," *October* 39 (1986): 55.
[21] Amade M'charek, "Tentacular Faces: Race and the Return of the Phenotype in Forensic Identification," *American Anthropologist* 122.2 (2020): 370, 375.
[22] Benjamin, *Race After Technology*, 122.
[23] Krimsky and Simoncelli, *Genetic Justice*, xvi.

investigators through the lens of racial bias. Further, they draw attention to the anxieties that surround the ubiquity effects of DNA phenotyping insofar as the technology can produce the any-face-whatever that could incriminate a given racialized population. And yet, such assessments fall short of acknowledging how racial profiling is in fact the product of particular medial techniques through which genetic material itself is transformed into phenotypic characteristics like skin color—even as dubious as such techniques might be. Following Jonathan Beller, in what follows I thus approach DNA phenotyping as a technical process that "entails an act of real abstraction as racial abstraction."[24] At issue here are the computational forms through which DNA is identified and analyzed as evidence of racial difference, or put differently, how race serves as the technical ground upon which phenotypic becomes bound to genotype. Rather than interpret the final portrait as a future-oriented prediction tool that might lead to possible discrimination in policing practices, I thus examine how DNA phenotyping makes race visible within composite portraits through the retrospective search for biogeographic ancestry. As I demonstrate, key to this process is how DNA phenotyping produces racial identity by constructing an unlived genetic past as the condition of possibility for prediction.

*AIMs and the Unlived Past*

In order to determine biogeographic ancestry, DNA phenotyping employs a technique called admixture mapping. Admixture mapping is a method of genetic analysis that offers a statistical assessment of the frequencies of specific loci within an individual that stem from two or more genetically diverse populations. The goal here is to locate parts of the genome that can be traced back to one previously isolated ancestral group. In the case of admixture mapping, the

[24] Jonathan Beller, *The World Computer*, 157.

loci under consideration are ancestry informative markers, or AIMs. First discovered in the late 1990s, AIMs are a subset of SNPs that are considered by some population geneticists as relevant for determining different ancestries. Unlike other SNPs for hair color which can be idiosyncratic, at AIMs nucleotide bases will only vary between biogeographic groups, but will show a high statistical consistency within those populations. By tracing large frequency differences in the human genome from admixed populations, population geneticists thus argue that one can ultimately locate panels of AIMs that indicate the ancestral population(s) present within a given DNA sample. These ancestral groups are typically divided among four geographic continental regions—African, European, Asian, and Native American—with more specific subpopulations within each category.

On the one hand, AIMs pose a problem for DNA phenotyping because they give lie to the notion that racial difference is encoded in genetic material, thus conflating skin pigmentation, race, and biogeographic ancestry. As many scholars have argued, by the turn of the twenty-first century, advancements in genetics research reinvigorated the notion that race is "bio-genetic" despite midcentury discourses in sociology that claimed race as a social construct.[25] Anthropologist Duana Fullwiley remarks that practices involved in commercial ancestry testing and forensic DNA phenotyping articulate a "contemporary synthesis" involving "an absorption of the old race thinking into modern race projects of a liberal persuasion."[26] This is especially true for the use of AIMs, which are often characterized by a "circular" logic that ties genetic variation to racial difference.[27] By tethering genetic ancestral markers to continentally-based

[25] Duana Fullwiley, "Race, Genes, Power," *British Journal of Sociology* 66.1 (2015): 37. See also Reardon, "Decoding Race and Human Difference in a Genomic Age"; Bolnick, "Individual ancestry inference and the reification of ace as biological phenomenon."
[26] Duana Fullwiley, "The 'Contemporary Synthesis': When Politically Inclusive Genomic Science Relies on Biological Notions of Race," *Isis* 105 (2014): 804.
[27] Fullwiley, "Race, Genes, Power," 42. On the relationship between AIMs and biogeographic continental ancestry, see Ramya Rajagopalan and Joan Fujimura, "Making History via DNA, Making DNA from History: Deconstructing

racial types, AIMs incorporate racial difference as an a priori assumption that is then ostensibly proven in the form of specific genetic panels. As bioethicist Pamela Sankar succinctly explains, "AIMs can be used to distinguish races because AIMs vary by race."[28] In this case, AIMs reinforce the notion that race is a biological reality and moreover that there is something biologically different about persons with varying biogeographical ancestries.

On the other hand, the use of admixture mapping to determine biogeographic ancestry suggests how DNA phenotyping is not simply concerned with inferring a person's physical appearance, but also with making claims about population-level genetic similarity that reanimate colonialist imaginaries of racial difference. To be sure, SNPs (like AIMs) are useful in DNA phenotyping because they index human genetic variation in a base-pair substitution that has been passed down through generations in ways that are now prevalent among contemporary biogeographic populations. However, these populations are not naturally occurring, but rather scientifically constructed as so-called "gene pools" that ostensibly have persisted for a certain period of time without genetic mixture.[29] Gene pools assume that some ancestral populations must have been isolated for longer than others, thus inheriting a purer genetic profile from the distant past to the near future. As Priscilla Wald observes, gene pools are "like a photograph of a population, fixing it in—and defining it by—a particular moment in time."[30] To construct gene pools, researchers often sample genetic material from indigenous communities on the

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the Race-Disease Connection in Admixture Mapping," in *Genetics and the Unsettled Past: The Collision of DNA, Race, and History*, eds. Keith Wailoo, Alondra Nelson, and Catherine Lee, 143-163 (New Brunswick, NJ: Rutgers University Press, 2012).

[28] Pamela Sankar, "Forensic DNA Phenotyping: Continuity and Change in the History of Race, Genetics, and Policing," in *Genetics and the Unsettled Past: The Collision of DNA, Race, and History*, eds. Keith Wailoo, Alondra Nelson, and Catherine Lee (New Brunswick, NJ: Rutgers University Press, 2012), 107.

[29] Lindy Braun and Evelynn Hammonds, "The Dilemma of Classification: The Past in the Present," in *Genetics and the Unsettled Past: The Collision of DNA, Race, and History*, eds. Keith Wailoo, Alondra Nelson, and Catherine Lee, (New Brunswick, NJ: Rutgers University Press, 2012), 68.

[30] Priscilla Wald, "Blood and stories: how genomics is rewriting race, medicine and human history," *Patterns of Prejudice* 40.4-5 (2006): 318.

supposition that they are untouched by genetic admixture. The result, argues Northern Paiute scholar Debra Harry, is a process of "biocolonialism" within which the biomes and knowledge systems of indigenous peoples are continually plundered and commodified in order to enable the construction of genetic pools against which more admixed populations can be compared.[31] Such colonial processes of admixture mapping are commonplace in genetic testing tools, including DNA phenotyping as well as direct-to-consumer genetic testing services like 23andMe.[32]

In order to structure biogeographical populations, admixture mapping bifurcates historical time along two different time scales: the modern present and the pre-colonial past prior to the moment when certain ancestral populations might have encountered each other. In Frudakis' textbook on DNA phenotyping, the "genealogical time frame" for admixture mapping is "arbitrarily" defined as any time "since 1492 AD, the beginning of the European colonial period."[33] In this case, the year 1492 is meant to index a break in historical time centered upon the Columbus voyages to the Americas where populations previously isolated from one another were suddenly put into contact, thus supposedly beginning a new epoch of genetic mixture. Frudakis explains how DNA samples from different contemporary biogeographic populations provide different views into the past:

> We obtain modern-day Native American samples from genetically isolated Maya populations in Southern Mexico, modern-day European samples from Mediterranean Europe, and Mexican American samples from admixed populations in urban areas of the United States. In this example, the admixture event took place approximately 400 years ago up until the present, after European

[31] Debra Harry, "Acts of Self-Determination and Self-Defense: Indigenous Peoples Responses to Biocolonialism," in *Rights and Liberties in the Biotech Age: Why We Need a Genetic Bill of Rights*, eds. Sheldon Krimsky and Peter Shorett, 87-97 (Lanham, MD: Rowman and Littlefield Publishers, 2005). Debra Harry, "Biocolonialism and Indigenous Knowledge in United Nations Discourse," *Griffith Law Review* 20.3 (2011): 702-728. See also Eugene Thacker, *The Global Genome: Biotechnology, Politics, and Culture* (Cambridge: MIT Press, 2006).
[32] In addition to DNA phenotyping, Snapshot also entails a kinship analysis toolkit. This service enables researchers to establish kinship relations up to eight generations in the past through the analysis of hundreds of thousands of SNPs in sample DNA. In this case, we can see more broadly how SNPs are mobilized in Snapshot as genetic windows into the past that retain their power as temporal units of ancestral inheritance.
[33] Frudakis, *Molecular Photofitting*, 126.

> expansion to North America. We assume that modern-day Europeans and modern-day Maya are perfectly representative at this time.[34]

At work here is a mythic narrative that situates biogeographical populations within static time frames oriented around the violent colonial encounter that inaugurated the New World while ignoring other historical periods of mass migration across cultural, social, and geographical boundaries. In this framework, ancestral and contemporary white European populations are ostensibly unaffected by colonial conquests, thus implying an apparent "fixity of whiteness" not given to other more admixed ethnic populations like Hispanics.[35] At the same time, argues Kim TallBear, the timescales of admixture mapping position indigeneity as somehow outside of history itself, as "primordial, as a genetic window to the past, as the source of 'all of us.'"[36] Taken together, within admixture mapping, the past emerges as a racialized site through which genetic material is stabilized into statistical records of biogeographic ancestry.

What these issues posed by admixture mapping suggest is that while the relationship between genetic material and racial categories is no doubt often wrongly conflated (as is the case more broadly between SNPs and phenotype), notable here too is how DNA phenotyping both enables and conceals a more complicated process through which AIMs are treated as a historical record to predict biogeographic ancestry in the present. As phrased by Keith Wailoo, Alondra Nelson, and Catherine Lee, AIMs are rendered as "scientific portals to the past" that enable us to

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[34] Frudakis, *Molecular Photofitting*, 80.
[35] Ramya Rajagopalan and Joan Fujimura, "Making History via DNA, Making DNA from History," 152.
[36] Kim TallBear, "Genomic articulations of indigeneity," *Social Studies of Science* 43.4 (2013): 519-520. For a more thorough discussion of the ways in which DNA databases and ancestral testing pose indigeneity as a genetic problem, see Susanne Berthier-Foglar, Sheila Colingwood-Whittick, and Sandrine Tolazzi, eds., *Biomapping Indigenous Peoples: Towards and Understanding of the Issues* (Amsterdam and New York: Rodopi, 2012); Kim TallBear, *Native American DNA: Tribal Belonging and the False Promise of Genetic Science* (Minneapolis: University of Minnesota Press, 2013).

rethink our collective history and build new notions of racial difference in the present.[37] And yet, these pasts are not fixed relations of historical time, but are deeply "unsettled"—they are manipulated, refashioned, and transformed through received frameworks of colonial difference in order to prop up genetic claims of biological human difference that can be used for contemporary political projects, like contesting boundaries or denying kinship or nationality.[38] In admixture mapping, DNA phenotyping thus instrumentalizes mythic pasts in order to cohere population-level formations of biogeographic ancestry that enable the prediction of facial morphology. Throughout, the retrospection of an unlived past emerges as a form of racism that flattens and elides histories of empire, chattel slavery, and migration.

In what follows, I posit the temporal dynamic of retrospection within DNA phenotyping through the technical and aesthetic form of the aorist, which describes how future events can be predicted through the unspecified past. Through the aorist, I show how DNA phenotyping treats genetic material as temporal information in order to stabilize an individual's identity in visual form. In this way, while DNA phenotyping is coterminous with Galton's project of aggregating composites of racial types and older forms of racial thinking within biometrics, it is nonetheless unique insofar as it uses genetic material to redefine race as the probabilistic search for an unlived past. Through the aorist, we thus better glimpse how DNA phenotyping generates ubiquity effects through probabilistic arrays of data cohered through the technics of social difference. Within every composite portrait dwells a palimpsest of unlived historical narratives that can unearthed to create the any-face-whatever present in DNA phenotyping case reports.

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[37] Keith Wailoo, Alondra Nelson, Catherine Lee, "Introduction: Genetic Claims and the Unsettled Past," in *Genetics and the Unsettled Past: The Collision of DNA, Race, and History*, eds. Keith Wailoo, Alondra Nelson, and Catherine Lee, (New Brunswick, NJ: Rutgers University Press, 2012), 1.
[38] Wailoo, Nelson, Lee, "Introduction," 4.

*Aoristic Analysis*

Stemming from the Ancient Greek word *aóristos* meaning "indefinite," the aorist is an aspectual form of the past tense that refers to an unqualified past event without an indication of its duration or completion. In Ancient Greek, the aorist referred to a simple or undefined past event that, relative to some point in time, was already completed. This is distinct from other aspectual forms of the past tense, such as the perfect (which refers to a past action that has continuing relevance for the present) and the imperfect (which refers to an ongoing or repeated situation). The aorist is now largely obsolete, surviving only in various verbal forms in Slavic and some South Caucasian languages. The English language does not have an aorist aspect, although its nearest equivalent would be the simple past tense—for example, "I read the book"—which refers to an event that has happened without reference to the period of time or whether the results of the event are still in effect.

While the aorist has largely receded in use across global languages, curiously it has found new life within contemporary information sciences. In the late 1990s, the aorist was taken up by a number of data researchers as a method of temporal analysis for predicting past events. Initially proposed by criminal geography scholars Jerry Ratcliffe and Michael McCullagh and later pursued individually by Ratcliffe, aoristic analysis investigates past events within an unspecified time frame by computing the probability that an event occurred within given parameters.[39] As defined by Ratcliffe, "aoristic analysis is an investigation that calculates the probability that an event occurred at a location within given temporal parameters and assigns this temporal probability weight to the spatial object, given that the actual instance of the event is

[39] Jerry Ratcliffe and Michael McCullagh, "Aoristic crime analysis," *International Journal of Geographical Information Science* 12.7 (1998): 751-764.

indeterminate but occurred between two known times."[40] Importantly, as a method of data science, aoristic analysis is a bastardization of the linguistic concept of the aorist. While the latter refers to an event in the past tense in an unmarked form, aoristic analysis examines the overall incidence of events occurring across a given timespan, and in doing so reconstructs the past as a temporal uncertainty. Thus, as opposed to some unmarked past as in the linguistic case, aoristic analysis constructs a probabilistic past by flattening or smoothing over historical time.

As a method of temporal prediction, aoristic analysis was key to the development of intelligence-led policing practices in the early twenty-first century. Indeed, crime seems to be a privileged site through which the aorist becomes legible as a problem for data analysis, thus suggesting an inherent carceral logic to this temporal dynamic that can extend towards other policing practices like DNA phenotyping. Consider, for example, a business owner who returns from a holiday to find that their storefront window has been shattered and that items are missing from display shelves. The owner can report the crime to law enforcement, however it will be unclear as to the precise date and time that the incident occurred. According to Ratcliffe, because crime data tends to "reflect the routine activities of the victims rather than the offense patterns of the offenders," police typically do not have access to the exact time that a crime occurred.[41] At most, police reports can register the event as occurring sometime after the owner left for vacation (*terminus post quem*) and sometime before their return (*terminus ante quem*). In this sense, the temporal bounds of the event, which Ratcliffe and McCullagh term an "aoristic crime," are uncertain, knowable only from the moment of observation rather than the moment of incidence.[42]

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[40] Jerry Ratcliffe, "Aoristic analysis: the spatial interpretation of unspecific temporal events," *International Journal of Geographical Information Science* 14.7 (2000): 670.
[41] Jerry Ratcliffe, "Aoristic Signatures and the Spatio-Temporal Analysis of High Volume Crime Patterns," *Journal of Quantitative Criminology*, 18.1 (2002): 23.
[42] Jerry Ratcliffe and Michael McCullagh, "Aoristic crime analysis," 754.

Aoristic analysis compensates for this problem by treating past events as probabilities distributed over a given time span rather than as discrete moments in time. Through a temporal search query, aoristic analysis extracts all possible events from a database and assigns a weighting to each event within a defined search parameter. This weighting reflects the possibility that the event happened within a given slice of time relative to the overall time span. This weighting is defined as:

$$t_{is}=\Delta/(\beta_i - \alpha_i)$$

where $\Delta$ is the temporal unit used to measure the time window (e.g. minutes, hours, or days), $\beta_i$ is the end time, and $\alpha_i$ is the start time. Say, for example, that the above burglary is known to have happened between a given Thursday and Monday. With a maximum period of five days and $\Delta$ defined as one day, the aoristic model would assign each day a weighting of .20. This same process can be repeated for other events recorded in a database that overlap across a given timespan regardless of specific start and end times, or lack thereof. Part of the benefit then of using this mode of analysis is that it can "smooth irregularities that arise from poor database interrogation" since all events are treated as probabilities rather than discrete moments in time.[43] By accumulating these probabilities, one can thus produce a histogram that plots the temporal distribution of weightings within a given timeframe. Ultimately, aoristic analysis is intended to reveal broader trends in criminal activity—for example, that burglaries tend to happen in the early hours of Monday morning.[44]

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[43] Ratcliffe, "Aoristic analysis," 669.

[44] This pattern was identified in Ratcliffe's first paper on aoristic analysis co-authored with Michael McCullagh in 1998. Examining six months' worth of data on vehicle burglaries through aoristic search methods, the researchers found a "Monday peak" that eluded other kinds of search methods, including an averaging temporal search (which averages the date and time fields to locate a given time) and a rigid temporal search (which only contains definite records within the search criteria). The researchers, however, did not provide a reasoning as to why this peak exists. Ratcliffe and McCullagh, "Aoristic crime analysis," 758. A similar study was repeated later in Matthew Ashby and Kate Bowers, "A comparison of methods for temporal analysis of aoristic crime," *Crime Science* 2.1 (2013): https://doi.org/10.1186/2193-7680-2-1.

Following Ratcliffe's research, aoristic analysis has since been taken up in predictive policing software like HunchLab despite some observed limitations.[45] In chapter 1, I examine HunchLab's algorithmic architecture to interrogate how weather data is mobilized to distribute criminal propensity across racialized populations. Here, I consider how the software consolidates a unique temporal dynamic, one that I'm tracking through the aorist, that reconstructs an unlived past in order to predict the future. To be sure, predictive policing emerged in part from early studies of aoristic analysis that aimed to supplement spatial understandings of crime with temporal dynamics. In this case, what makes aoristic analysis advantageous for predictive policing is how it can predict the temporal patterns of high-volume crime in order to allocate patrol units accordingly across a given spatial terrain. As Ratcliffe and McCullagh argue in their initial 1998 paper, "aoristic crime analysis is a method of charting the historical pattern over variable small areal units, independent of influence from neighbouring cells. Each cell can be plotted to examine the rise and fall of crime compared with a variable threshold over time. Temporal trends *in extrema* can be examined for patterns and can be correlated against other intelligence gathered at the police station."[46] Key here is how aoristic analysis can be integrated

[45] While its probabilistic approach can be useful for uncovering patterns in databases, aoristic analysis is not without its setbacks. Criminal justice scholars Martin Andresen and Greg Jenion suggest that aoristic search methods should not be used for crimes that have extreme time ranges. Martin Andresen and Greg Jenion, "The Unspecified Temporal Criminal Event: What is Unknown is Known with Aoristic Analysis and Multinomial Logistic Regression," *Western Criminology Review* 5.3 (2004): 4. Ratcliffe notes too that aoristic analysis is not amenable for crimes for which the possible time span is greater than twenty-four hours as this would diminish sensitivity to finer temporal units of analysis. Ratcliffe, "Aoristic Analysis," 673. In addition, Andresen and Jenion note that although the technique acknowledges the temporal aspects of crime, "aoristic analysis does not incorporate a major component of environmental criminological understanding: crime is neither randomly nor uniformly distributed over time and space" (10). Most of all, Andresen and Jenion observe, aoristic analysis is descriptive, not inferential. In the absence of any theoretical framework or casual variables, it can only provide an indication of when an event might have happened (and thus when an event might be prone to happen), but not why it might happen at a particular time. As they remark, "we acknowledge that the purpose of aoristic analysis is not statistical inference, but a smoothing algorithm. Without statistical inference, however, the possible uses for the method are limited" (4). On this note, Andresen and Jenion suggest that aoristic methods should be supplemented with other techniques like multinomial regression that do not impose a uniform distribution of time upon criminal activity and instead integrates nonlinear relationships among variables that allows for hypothesis testing.

[46] Ratcliffe and McCullagh, "Aoristic Crime Analysis," 763.

with spatial data on crime to produce what Ratcliffe calls "snapshots" that reveal the probability that an event occurred within a specified cell. Each snapshot functions like a slice of time that maps crime with respect to the probabilistic weighting assigned to it during an aoristic search. As time changes, such weightings shift as well, revealing new "aoristic signatures" that describe the probability that a given crime will occur in a given location at a given time.[47] Ultimately, by producing multiple snapshots and piecing them together "like a strip of celluloid" or an "animation," one can produce hotspots that register changes in the distribution of probability across time and space.[48] Here Ratcliffe situates hotspots within a cinematic imaginary in which risk is registered as a change over time wherein gaps between different snapshots of historical time are filled to produce the impressions of a changing whole across space.

In HunchLab, aoristic analysis is similarly deployed to represent "the relative uncertainty of the exact event time" to enable predictions about future criminal activity.[49] In particular, aoristic analysis can be integrated into machine learning processes to build predictive models of crime. Through aoristic analysis, the machine learner constructs a training set that is ambivalent to the time span of the cell in question, instead treating each criminal event as a set of distributed probabilities. I quote here at length from a 2015 document titled "HunchLab: Under the Hood":

> For instance, assume we are creating a training example for a particular raster cell from 9:00 AM to 10:00 AM on January 16, 2014. There is one crime that may have occurred during this period. The event happened between 9:00 AM and 11:00 AM. We therefore have two scenarios from 9:00 AM to 10:00 AM: (1) 0 events occurred and (2) 1 event occurred. We assume that the event is uniformly likely to have occurred during the aoristic time frame (2 hours in length), so each of these scenarios is equally likely (1 hour / 2 hours = 50% probability). Both scenarios are placed into the training example set for use in modeling with a weight of 0.50 for each scenario.[50]

[47] Ratcliffe, "Aoristic Signatures," 38.
[48] Ratcliffe, "Aoristic Analysis," 675.
[49] Azavea, "HunchLab: Under the Hood," 18.
[50] Azavea, "HunchLab: Under the Hood," 18.

In this example, aoristic analysis is used specifically for data that otherwise exceeds or complicates the defined temporal bounds of the raster cell in question. Assigning the event a weighting of 0.50, the model assumes that it either happened or it didn't. As the training process continues across various iterations, the model then randomly selects either of the two scenarios to determine the probabilistic outcome within a given raster cell. Here, HunchLab's program smooths over the temporal snarls that punctuate database management in order to reconstruct a fictional past that can be instrumentalized to predict future crime. Ultimately, by integrating spatial information with aoristic methods, HunchLab produces hotspots that measure the relative potential that a particular type of crime might occur in a given location and at a given time. And, as I discuss in chapter 1, such hotspots are markers of a racializing security apparatus that distributes risk to marginalized communities across carceral topographies.

Importantly, the aorist marks a particular configuration of time within surveillance technologies that shifts the emphasis of prediction away from the future and towards the past. While concepts such as preemption, premediation, and feed-forward are no doubt critical for calling attention to how contemporary algorithmic systems foreclose the emergence of unspecified risk via the computation of possible projected futures, they often neglect to consider how those very same technologies operate through techniques of retrospection.[51] To be sure, retrospection is already a central part of predictive technologies.[52] In her study of recommender systems, Wendy Chun observes how the outputs that come from machine learners "are verified

[51] Richard Grusin, *Premediation: Affect and Mediality after 9/11* (Houndmills, Basingstoke: Palgrave MacMillan, 2010); Brian Massumi, *Ontopower*; Mark Hansen, *Feed-Forward: On the Future of Twenty-First-Century Media* (Chicago: University of Chicago Press, 2015).

[52] Even decades before the development of contemporary big data surveillance, psychologists Hillel Einhorn and Robin Hogarth remark that "while forecasting involves forward/predictive thinking, it depends crucially on prior diagnosis for suggesting a model of the phenomenon, for defining relevant variables, and for evaluating forecast accuracy via the model." Hillel Einhorn and Robin Hogarth, "Prediction, Diagnosis, and Causal Thinking in Forecasting," *Journal of Forecasting* 1 (1982): 23.

as correct if they predict the past correctly, for they are usually cross-validated using past data that are hidden during the training period or out of sample data, similarly drawn from the past."[53] In this case, machine learners never simply extrapolate the future, but rather draw correlations among data describing previous states of the world in order to produce a general model that can be applied to new, yet-to-be-observed, data. The resulting formula, she proposes, is "the likely future equals the missing past."[54] The aorist draws upon and extends these practices of retrospection at work in machine learning by reconstructing the past as a series of probabilistic events that smooths over uncertainties in the dataset. The example from HunchLab is case in point. By transforming historical crime data into weighted potentials, aoristic analysis provides the grounds upon which the software can make inferential claims about where crime might occur in the future. Aoristic analysis reconstructed the past as a temporal uncertainty in order to make future crime possible.

*The Face Space and the Heat Map*

While aoristic analysis was originally developed for intelligence-led policing software, I argue that it need not be limited to surveillance systems like HunchLab that explicitly use such methods. Rather, as a technical form, the aorist bares significance for other modes of predictive analysis that reconstruct the past as an unsettled series of probabilistic events. Stated more pointedly, the aorist concerns *the techniques of production of an unlived past rendered as a series of weighted probabilities in order to predict the future*. Within this framework, the aorist

[53] Wendy Chun, *Discriminating Data*, 46.
[54] Chun, *Discriminating Data*, 160. Similarly, Momin Malik contests that prediction is not really prediction at all, but simply the production of "post hoc statements about the strength of correlations." For this reason, Malik suggests that we might rephrase prediction as "backtesting" or "retrodiction" insofar as the goal is to fit new data into models inferred from past events. Momin Malik, "A Hierarchy of Limitations in Machine Learning," *arXiv*, February 2020, https://arxiv.org/abs/2002.05193, 45.

can be located within other kinds of surveillance technologies that produce predictions through statistical assessments of the past. This is the case for DNA phenotyping products like Parabon's Snapshot. Undoubtedly, as a forensic practice, DNA phenotyping is already steeped in retrospection insofar as it aims to reverse-engineer the past to discover the cause of a criminal event. More than that, however, the aorist is useful for drawing attention to how DNA phenotyping predicts composite portraits by reconstructing an unlived past of biogeographic ancestry. Importantly, by situating the aorist within DNA phenotyping, I do not intend to affirm or legitimate its predictive capacity. Rather, I mobilize the aorist here as a technical form to examine how DNA phenotyping renders the historical contingencies of social difference as probabilistic weights within the final composite portrait. Just like the 'snapshots' in Ratcliffe's study, Parabon's own Snapshot technology uses a heat map system to render facial morphology as a spatiotemporal arrangement of modular units that can be shifted to produce racial and gendered variance. In this way, the heatmap emerges as the dominant aesthetic motif of the aorist that visualizes the distribution of probabilities within set parameters of analysis.

A closer look at Parabon's research and publicity materials for Snapshot reveals how the software application mobilizes the aorist as a technical form in order to construct predictive composite portraits. At the core of Snapshot's innovation in DNA phenotyping is the use of machine learning to produce statistical models of phenotypic characteristics that can be applied to composite portraits.[55] This involves a multiple step process of data collection, modeling, and

[55] While Snapshot might have been one of the first software applications to use data modeling methods to produce predictive composite portraits, such methods were earlier anticipated by Frudakis in his 2007 textbook on molecular photofitting. Rather than assume that phenotypic characteristics can be directly gleaned from genotype, one might rather employ "empirical observation" in the form of database management which allows researchers to make generalized inferences about an unknown DNA sample against a corpus of genetic profiles and digital photographs. As Frudakis writes, "guessing about phenotype expression as a function of admixture or other ancestral affiliation would be to be impossible without the use of such an empirical tool, because each phenotype has a different genetic (and environmental) basis and anthropological history, and because the relationship between ancestry and phenotype

prediction.[56] First, Parabon's bioinformatics team amassed a genotype-and-phenotype (GaP) database of DNA samples and three-dimensional facial scans provided by volunteers. Each entry contains a genetic profile of the individual consisting of known phenotypic markers (e.g. eye color) as well as the individual's self-reported ancestry and skin color. This database defines a set of 150 populations divided among nine global continental ancestry groups (African, African American, Central Asian, East Asian, European, Latino, Middle Eastern, Native American, Oceanian) based on a representative sampling of AIM panels from volunteers who self-reported their biogeographical ancestry. As of 2020, Parabon had over 13,000 subjects in their database representing over 150 biogeographic ancestral populations across the world.[57] Second, Snapshot uses machine learning to produce statistical models of a given phenotype through a genome-wide association study. In this step, Parabon's bioinformatics team performs large-scale statistical analysis on hundreds of thousands of individual SNPs and billions of SNP combinations to identify genetic markers associated with a given phenotype. The top SNPs for each phenotype are identified and combined within a machine learning program to produce a model that can be used to predict the phenotype of an unknown DNA sample. Importantly, skin color is determined using genetic data on biogeographical ancestry through the analysis of AIMs compared against the self-reported ancestry and skin color from donors. Finally, using these predictive models,

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may differ from population to population." Frudakis, *Molecular Photofitting*, 448. For a more detailed history of Snapshot and its relationship to other DNA phenotyping products, see Arnold, "Crimefighting with Family Trees."

[56] This process is outlined in Ellen Greytak and Steven Armentrout, "DNA Phenotyping: Predicting Ancestry and Physical Appearance from Forensic DNA," Parabon NanoLabs, https://www.promega.jp/-/media/files/products-and-services/genetic-identity/ishi-26-oral-abstracts/19-greytak.pdf

[57] Greytak, "Advancing Forensic DNA Analysis in Support of DoD Missions." To build up their database, Parabon researchers traveled to different parts of the world to collect DNA samples from volunteers representing different biogeographic ancestral populations. More recently, Parabon has introduced a mobile application through which volunteers can submit 3D facial scans and DNA profiles already obtained from private genetics companies including AncestryDNA, 23andMe, National Genographic, or FamilyTreeDNA.

Snapshot assesses genetic material from a crime scene for its statistical match within each phenotypic trait model.

In addition, Snapshot uses machine learning to create composite portraits. To do so, Snapshot creates a "face space" that allows the software application to produce generalized facial structures onto which externally visible characteristics can be applied. Described by Greytak and Steven Armentrout (founder and CEO of Parabon), the "face space" is a predictive map of morphological models that describes the "majority variation among faces."[58] It is built by converting the photographs of DNA donors in Parabon's database into morphological data arrays that describe each face with over 7,000 quasi-landmarks in three-dimensions. Using Principle Component Analysis (PCA), Snapshot then identifies the most salient morphological variations among faces according to fundamental landmark structures (e.g. the nose, the chin, the brow). In Figure 2.4, we see Snapshot's face space with the top five principle components distributed along a two-dimensional plane. The vector PC1 describes the greatest amount of variation among the faces in the database, which Greytak narrates as "going from a very short, round feminine face to a long, narrow masculine face."[59] This single vector, however, only captures about twenty to thirty percent of the total variation among faces, thus additional vectors are required to summarize variation according to other landmarks (PC2, PC3, and so on).

[58] Greytak and Armentrout, "DNA Phenotyping," 3.
[59] Greytak, "Advancing Forensic DNA Analysis in Support of DoD Missions."

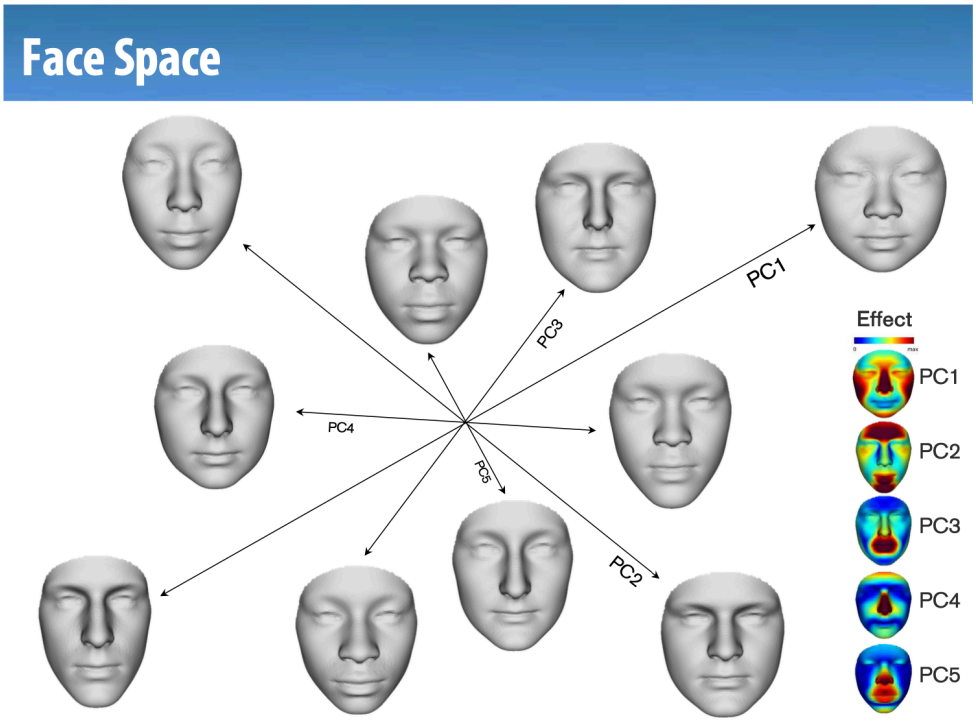


Fig. 2.4: The Face Space map showing the first five principal component vectors for facial morphology. Ellen Greytak, "Advancing Forensic DNA Analysis in Support of DoD Missions," webinar, 2020. Screenshot by author.

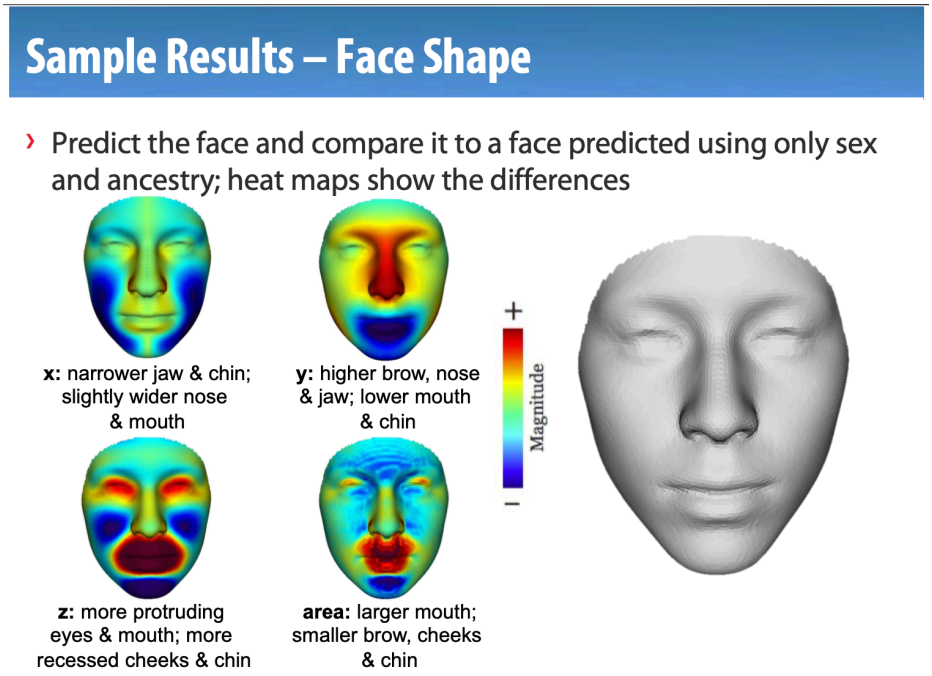


Fig. 2.5: An example of how heatmaps are used to visualize facial morphology in composite portraits. Ellen Greytak, "Advancing Forensic DNA Analysis in Support of DoD Missions," webinar, 2020. Screenshot by author.

Using the face space, Snapshot then predicts the facial morphology of unknown DNA samples in a process that Frudakis calls "reverse facial recognition" in his 2007 textbook on molecular photofitting.[60] First, Snapshot compares an initial prediction of facial morphology using the face space to cross-validated predictions made on subjects in the GaP database. These subjects from the database are chosen based on similarity to the unknown DNA sample according to sex and ancestry. As described by Greytak and Armentrout, the comparisons are then "visualized as heat maps" which show the composite averages of facial morphology measured against the predicted portrait to reveal "the parts of the face that are changing in each spatial dimension."[61] Figure 2.5 shows an example of heat maps used to visualize differences in facial morphology within a composite profile. In the heat map, areas of red and blue indicate the relative increase and decrease of facial landmark structures in three-dimensions as compared to the "average" subject in the database. What is key in this heap map visualization is how morphological difference is determined on the basis of similarities in sex and ancestry between the suspect and DNA profiles in the database. In this case, Snapshot renders genetic data of sex and ancestry into principal component vectors that serve as correctives for facial morphology when analyzed through predictive models. This is problematic for many reasons, notwithstanding the fact that such predictions might have little to no relationship to one's actual physical appearance. Indeed, while biological sex might be genetically verifiable through the analysis of chromosomes in a DNA sample, one's gender presentation can vary from cis heteronormative standards.[62] This is especially the case for, though not limited to, trans and

[60] According to Frudakis,"reverse facial recognition" uses "very specific information from individuals (their DNA) to reconstruct crude anthropometric features, which is the opposite of facial recognition software that uses crude anthropometric features for identification." Frudakis, *Molecular Photofitting*, 451-452.
[61] Greytak and Armentrout, "DNA Phenotyping," 5.
[62] Importantly, despite the adherence to genotypic dimorphism that characterizes DNA phenotyping, genetic sex itself does not have bearing on gender identity and, in principle, any chromosome may contain genes relevant to sex

gender non-conforming persons (as in the case of Chelsea Manning, to which I will return in the next section). Additionally, insofar as biogeographical ancestry is taken to be a significant unit of variance among faces, one's physiognomy is inferred based on stereotypical mappings of facial features that purportedly "belong" to certain ethnic and racial groups.

However, beyond these initial critiques of Snapshot's composite portraits, more crucial to note here is how the heat maps reveal how the aorist underpins the abstraction of racial difference into modular units of probabilistic data. In order to perform reverse facial recognition, Snapshot binds together individual genetic profiles within its GaP database by reconstructing an unlived past as site of perceived shared ancestral affiliation. This unlived past is then used as the basis by which heat maps determine the deviation of a suspect's face from probabilistic statistical models of race and sex. Within these heat maps, facial morphology is in turn rendered as probabilistic spatiotemporal units of social difference that can be manipulated to yield new suspect identities. Importantly, morphological deviation is not simply measured against the "average" subject in the database based on identified markers for sex and ancestry. Rather, through processes of admixture mapping, the prediction of facial morphology is only possible due to the fabrication of gene pools of biogeographic ancestry oriented around the fixity of whiteness within an unlived historical past. Whiteness as such emerges as prototypical within DNA phenotyping insofar as it formats the base condition upon which variation in facial morphology become legible as racial and gendered identity. Within each portrait are sediments of a retrospective colonial past that are excavated, statistically modulated, and spatially recombined into heatmaps that flatten social difference as probabilistic modular weights.

differences. Sarah Richardson, *Sex Itself: The Search for Male and Female in the Human Genome* (Chicago: University of Chicago Press, 2013).

Through the aorist, we thus begin to see how Snapshot produces predictive composite portraits through the probabilistic reconstruction of an ancestral past. Importantly, however, the public display of heat maps in Snapshot's case reports suggest that the aorist shouldn't simply be regarded as a strictly technical logic, but also an aesthetic form that renders social difference legible through techniques of data visualization. That is, heatmaps are aesthetic techniques for reconciling the probabilistic weightings of facial morphology within a visual form—the face—that can be interpreted as evidence of racial and gendered embodiment. We see the aesthetic dimensions of the aorist at work in a behind-the-scenes shot of Snapshot's computational process in an episode of the dramatized criminal forensics series *Forensic Files II* titled "A Killer Photograph" (S1E12, aired 2020). The episode tells the story of a cold murder case in southwest Louisiana from 2009 that was solved in 2015 after local authorities contacted Parabon to produce a predictive composite portrait of the suspect.[63] The DNA profile revealed the suspect to be a white male of northwest European ancestry with greenish-blue eyes and dark hair, whereas previously detectives thought that the suspect might have been a Hispanic male. At one point in the episode, Armentrout and Greytak introduce Snapshot and explain how it fabricates its composite portraits which, they remark, are "not photographs [but] a summary of the prediction information … coming from the DNA." Curiously, while Parabon insists that the composite portrait should not be interpreted as an index of an individual's appearance, it is suggested that the images nonetheless should be recognized as indisputable insofar as they are causally produced from genetic material. All the while, shots of genetic code, double-helix animations, and the 3-D photographic rig in the Parabon facilities complement the talking head interviews, in turn conveying a tone of scientific authority to the criminal forensic process.

[63] More information about the case, including the composite profile, is available on Parabon's website: https://parabon-nanolabs.com/news-events/2015/09/snapshot-bouzigard.html.

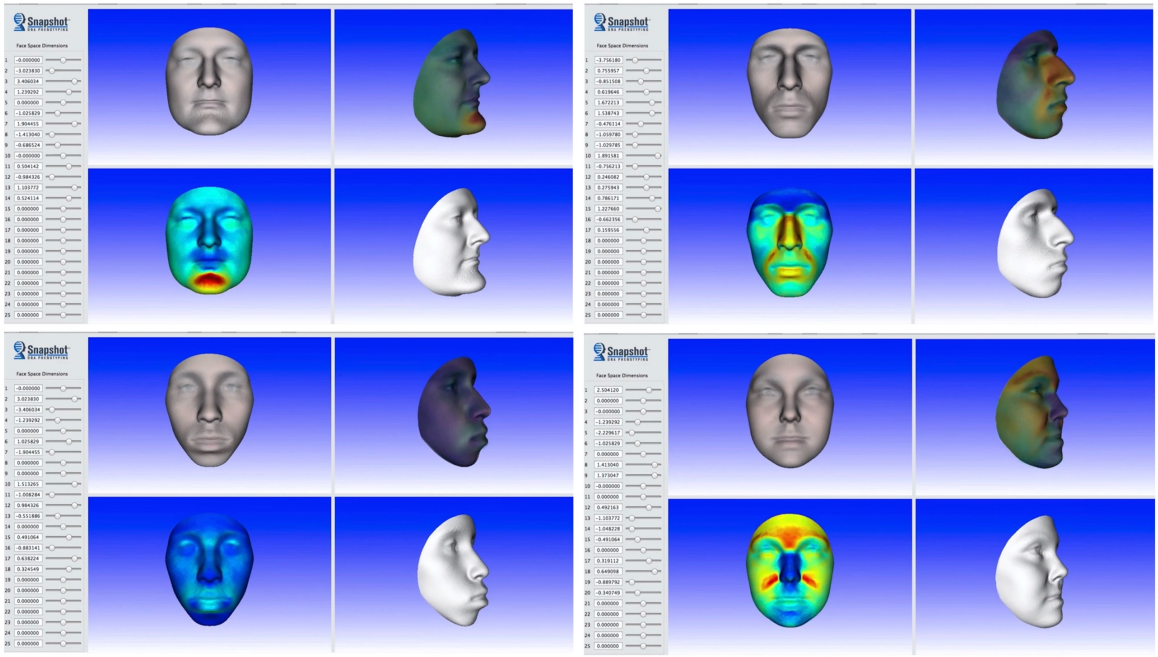

Fig. 2.6: A series of four still images from a single shot in the episode of *Forensic Files II* called "Killer Snapshot" (S1E12, aired 2020). The sequence of stills should be read horizontally from the top left to the bottom right. Screengrabs taken by author.

At a one moment in this section from the *Forensic Files II* episode, audiences are shown a monitor display of composite faces produced by Snapshot (Fig. 2.6). The faces are presented from the front and side without identifying phenotypic characteristics like skin or eye color, next to which we find their associated heat maps. On the left side of the screen is an array of sliding scales corresponding to the top principal component vectors in the face space map (i.e. PC1, PC2, and so on). As the shot progresses, the sliding scales move back and forth, changing the morphological makeup of the faces. Noses shrink, cheeks recede, and jawlines expand as one composite face morphs into the next. In this visual, we witness how DNA phenotyping produces multiple forms of identity by simply changing the weighted distributions of sex and ancestry. Through the aorist, Snapshot scaffolds facial morphology on the production of an unlived ancestral past, and in doing so yields the any-face-whatever that subtends the technology's ubiquity effects as a potential form of indiscriminate surveillance.

Crucially, the face here operates as a performative tool for translating probabilistic models of biogeographic ancestry into a visual register that makes data legible as racial and gendered embodiment. Indeed, nowhere in the television show are these faces labeled as indexing a particular gender or racial group, but as viewers we nonetheless mobilize existing frameworks of social difference to make them intelligible as individual identities. As the sliding scales move, new faces materialize, revealing for example what we might perceive to be a "white male face," a "Hispanic male face," a "Black female face"—and potentially so much more with each new configuration of principal component vectors. In this case, just as heat maps give visual form to data about biogeographic ancestry and sex, so too do we bring to these heat maps our own received frameworks of racial and gendered embodiment to make data legible. It is neither the case that DNA phenotyping produces racialized and gendered identity nor that the human interpreter perceives the portrait as incontrovertible evidence of identity bound to genetic material. Rather, the portrait's claims to identity are generated and maintained at the intersection of human and machinic forms of sensemaking. As a technical and aesthetic form, the aorist thus suggests that while predictive composite portraits might appear to produce stable representations race and gender, beneath them lies a complex of heterogenous, unstable, and ambiguous relations that are brought forth and given visual form through the technics of social difference. The any-face-whatever emerges as the inconsequential outcome of the technical and aesthetic dynamics of the aorist that abstracts the social within DNA phenotyping.

*Probably (Not) Chelsea*

I return now to Heather Dewey-Hagborg in this final section to consider how her art practice stages and complicates the ubiquity effects of DNA phenotyping that result from the

technical and aesthetic form of the aorist. As many critics note, what's crucial about her work is how she foregrounds the probabilistic dynamics of DNA phenotyping by producing multiple portraits from a single genetic profile. This any-face-whatever in turn opens the gap between genotype and phenotype to reveal the fictions behind predictive composite portraits like those produced by Snapshot. At yet, at the same time, I argue that her installation practice reveals how the ubiquity effects of DNA phenotyping are not simply the result of algorithmic processes, but are instead grounded in the social technics of the security state—a fact made legible through the construction of Manning's trans identity within military, law, and journalism discourse during her trial and incarceration. In this way, her work provides an occasion to witness how the aorist emerges as a generative technical and aesthetic form of the neoliberal security state wherein the inherent probabilistic dynamics of genetic data can be engineered to produce differentiating effects of biometric surveillance.

A self-described "biohacker," Dewey-Hagborg blends artistic practice and scientific research to critique the politics and ethics of genetic profiling in the twenty-first century. Prior to her work with Manning, she first gained notoriety in the contemporary art market for *Stranger Visions* (2012-3). In this project, Dewey-Hagborg used DNA phenotyping methods to create portraits from litter like cigarette butts and chewing gum that she recovered from public areas in New York City. Extracting information on an individual's haplogroup (a combination of SNPs that tend to be inherited together across generations of biogeographic populations specifically through maternal or paternal lineages) in conjunction with SNPs associated with hair and eye color, the artist inferred aspects of one's facial morphology to produce predictive portraits. In the installation, three-dimensional prints of the faces were displayed alongside the collected debris, a photograph of the place it was recovered, and a summary of the genetic profile. In subsequent

works, like *DNA Spoofing* (2013) and *Invisible* (2014), Dewey-Hagborg explores possibilities for resistance to practices of genetic surveillance by showing how DNA evidence can be swapped, hacked, exploited, and fabricated to obfuscate one's identity.

Within the past decade, Dewey-Hagborg's art practice has become a lightning rod for contemporary national debates on privacy rights and technology ethics in the age of genetic surveillance. What's notable here, and perhaps unsettling too, is how she extends upon developments in genetic profiling already used by criminal forensic investigations. Similar to covert dragnet operations, Dewey-Hagborg created composite portraits in *Stranger Visions* without prior consent by recovering genetic material from public spaces. Indeed, *Stranger Visions* eerily mimics a public service campaign launched in 2015 by Ogilvy & Mather in Hong Kong in which Snapshot was used to predict the faces of individuals from trash, which were then displayed on posters around the city to deter littering. To this end, Dewey-Hagborg's practice rests precariously on the line between art and industry, such that her projects at times seem indistinguishable from leading DNA phenotyping case reports. Critics have in turn questioned whether or not Dewey-Hagborg "in challenging structures of technological, economic, and institutional power through art incorporating digital technologies… risk[s] replicating those same structures of power."[64] One might note, for example, the bias inherent in the process of making Manning's DNA portrait in *Radical Love*. After creating a litany of potential faces, Dewey-Hagborg elected to choose whichever one she thought looked feminine or gender neutral. The work thus potentially reproduces gender as a visual icon within surveillance systems wherein transgender identity is narrated as a teleological trajectory accomplished through techniques of bodily modification and passing. Nonetheless, the artist admits that while her work is

[64] Luke Stark and Kate Crawford, "The Work of Art in the Age of Artificial Intelligence: What Artists Can Teach Us About the Ethics of Data Practice," *Surveillance & Society* 17.3/4 (2019): 449.

"intentionally very controversial," her goal is to "create a public dialogue concerning the emergent possibility of genetic surveillance" that might inform public policy on genetic privacy.[65] To this end, Dewey-Hagborg has since critically reflected on how her own work interfaces with advancements in DNA phenotyping, particularly how genetic surveillance technologies risk racial stereotyping when creating algorithmically derived composite portraits.[66]

Fig. 2.7: In the installation *Probably Chelsea* (2017), a collection of thirty different possible portraits of Manning derived from her genetic profile are suspended from the ceiling of a gallery. Used with permission from artist.

While Dewey-Hagborg utilizes the same technology and methods as products like Snapshot, her installation practice stages a public encounter with DNA phenotyping that goes beyond simple appropriation and instead opens up the possibility for critique of the ubiquity effects of genetic prediction. Put differently, rather than thematizing the ethical risks of genetic

[65] Heather Dewey-Hagborg, "Sci-Fi Drama With a Strong Black Lead," *The New Inquiry*, July 6, 2015, https://thenewinquiry.com/sci-fi-crime-drama-with-a-strong-black-lead. As the artist reflects elsewhere, such a critical discourse on genetic surveillance might take the "form of biopolitical art which utilizes visuality to expose and undermine the paradox of visibility—a form of art which operates in seemingly contradictory ways, to make the disappeared visible and the apparatus of visibility problematic." Dewey-Hagborg, "Hacking Biopolitics."
[66] Dewey-Hagborg, "Hacking Biopolitics"; Dewey-Hagborg, "Sci-Fi Drama With a Strong Black Lead."

surveillance, Dewey-Hagborg's artwork invites audiences to interrogate how DNA phenotyping fails to properly render the inherent probabilistic nature of genetic material into a stable visual form, thus revealing the inaccuracies of the surveillance technology within the form of the any-face-whatever. Consider, for example, the installation *Probably Chelsea* (2017) (fig. 2.7), which was created two years after *Radical Love* to commemorate the commuting of Manning's sentence by President Barack Obama in the final days of his presidency. In this work, Dewey-Hagborg stretched the limits of DNA phenotyping by using Manning's genetic profile to create multiple versions of her portrait that vary in facial morphology, skin tone, eye color, hair color, and gender. Like the faces in *Radical Love*, those in *Probably Chelsea* were produced by analyzing specific polymorphisms in Manning's DNA to infer phenotypic characteristics. However, this time, the artist took even more liberties in interpreting Manning's genetic profile. For example, Dewey-Hagborg notes that while the SNP associated with blue eyes (which is present in Manning's DNA) is often considered synonymous with Northern Europeans, it can also be found in Hispanic, African American, and South Asian populations.[67] In addition, Dewey-Hagborg found that Manning's haplogroup is J, which suggests mutations in her genome that are shared among those with ancestries from the Middle East, Turkey, Caucasus, Italy, Greece, the Balkans, North Africa. This haplogroup not only contradicts assumptions about biogeographic ancestry based on the SNP for eye color, but also suggests innumerable phenotypic permutations that might be possible based on Manning's DNA. In the resulting installation, the artist 3D printed a collection of thirty possible portraits and suspended them from the gallery ceiling at different heights to visually resemble a mass or crowd. As she explains, this display is not only meant to reveal the arbitrary construction of genetic portraits,

[67] Heather Dewey-Hagborg, "Probably Chelsea," in *A Becoming Resemblance*, eds. Heather Dewey-Hagborg and Chelsea Manning (New York City: Fridman Gallery, 2017), 13.

but also to evoke "a kind of DNA solidarity" that suggests how "on a molecular level we are all Chelsea Manning."[68]

Like *Radical Love*, *Probably Chelsea* interrogates how DNA phenotyping constructs multiple configurations of identity that transcend ostensibly stable genetic boundaries of sex and biogeographical ancestry. In doing so, the installation casts into doubt the accuracy of DNA phenotyping products like Snapshot by staging identity not as a genetic fact, but as the result of algorithmic processes that negotiate the inherent probabilistic nature of genetic surveillance. As Claudio Celis notes, "*Probably Chelsea* is not looking for Chelsea Manning's 'authentic self.' Its thirty different portraits are instead highlighting the fact that identity cannot be separated from the technological devices that define it or from the power relations that shape it."[69] Rather than resemble the actual person, Manning's portrait is mediated across modular scales of racial and gendered data that in turn reconstruct her identity in the process. Such is the case more broadly for biometric technologies. As surveillance scholars have demonstrated, identity does not pre-exist the use of facial recognition systems, but is produced through specific machine vision algorithms that correlate observable facial landmarks in relation to a database of images defined, labeled, and clustered as distinct racial and gendered facial types.[70]

At work in these critiques is the suggestion that Dewey-Hagborg's art practice reveals how the internal contradictions that animate the aorist as a technical and aesthetic form within DNA phenotyping can operate as a site of disruption or resistance to surveillant power. By negotiating genetic markers of biogeographic ancestry through modes of probabilistic analysis,

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[68] Dewey-Hagborg, "Probably Chelsea," 11.
[69] Claudio Celis, "Critical Surveillance Art in the Age of Machine Vision and Algorithmic Governmentality: Three Case Studies," *Surveillance & Society* 18.3 (2020): 309.
[70] Lucas Itrona and David Wood, "Picturing Algorithmic Surveillance: The Politics of Facial Recognition Systems," *Surveillance & Society* 2.2/3 (2002): 177-198; Magnet, *When Biometrics Fail*; Browne, *Dark Matters*; Joy Buolamwini and Timnit Gebru, "Gender Shades"; Louise Amoore, *Cloud Ethics: Algorithms and the Attributes of Ourselves and Others* (Durham: Duke University Press, 2020).

DNA phenotyping fails to cohere a stable representation of Manning's identity and instead leaves the viewer with the any-face-whatever as a sign of the technology's dubious claims to accuracy. In this sense, the aorist has particular saliency for trans and gender non-conforming individuals like Manning for whom gender identity contains a temporal dimension of self-invention that defies the predictive binaries of sex within scientific discourses of DNA phenotyping. And yet, as I demonstrated in my reading of Parabon's publicity and research materials, the aoristic is in fact a constitutive feature of the temporal dimensions of genetic retrospection in which the production of a composite face is contingent upon the reconstruction of an ancestral past. In this case, I argue that by using the same techniques of DNA phenotyping, Dewey-Hagborg's practice similarly reveals how the ubiquity effects of the aorist, far from undoing the objective claims of DNA phenotyping, in fact reconsolidates surveillant power within its technical processes. More specifically, I argue that the aorist is not simply consigned to specific algorithmic processes of probabilistic computation, but is rather a central component of the malleable logics of the neoliberal security state.

The connections between the aorist and security logics become clear when we consider more carefully the specificity of Manning's case and the public visibility of her transgender identity, a fact rarely commented upon by Dewey-Hagborg and critics of her work. As numerous trans studies scholars have argued, trans visibility is a contested site of power that jockeys between representation and surveillance, between rights-based inclusion discourse and state-sponsored violence.[71] Manning's case in particular, as Susan Stryker and Paisley Currah write, "raises complex questions about the relationship of transgender identity to issues of state, to

[71] See, for example, the collection of essays in Gossett, Stanley and Burton, eds.,, *Trap Door*. On the contested status of transness, Eric Stanley similarly observes how racialized trans/queer identity is an "inclusive exclusion" necessitated by the liberal state insofar as it must exist in order to be expunged to hold up the phantasmic order of the democratic subject. Stanley, *Atmospheres of Violence*, 34.

moral and political agency, to visions of social justice, and to strategies of social transformation."[72] At the time of her trial, Manning's identity was a highly controversial affair among military, media, and legal discourses which were constantly reconstructing a fictional past for the whistleblower in order to make sense of her actions. Throughout, her identity was consistently manipulated on all sides of the political spectrum in order to make transphobic claims about her individual motives in leaking classified documents or to bring attention to the military's treatment of gender and sexual minorities (especially the extrajudicial torture that she experienced while incarcerated).[73] This was exceedingly the case for LGBT advocacy groups (which at the time were lobbying to repeal the Don't Ask, Don't Tell policy) who used her transgender identity to cast her either as a sympathetic gay male victim who should be supported by the military or as a deceptive trans terrorist undeserving of support. In both instances, Dean Spade and Craig Willse explain, "the portrayal of Chelsea Manning's gender and sexual orientation puts the articulation of an anti-homophobic politics aligned with U.S. militarism on display."[74] In this way, Manning's case demonstrates how trans identity can be accommodated by the neoliberal security apparatus insofar as it could uphold structures of homonationalism and heteropatriarchy.

What's significant in these debates is how Manning's trans identity became variably intertwined with broader processes of racialization central to the US security state. For some scholars, this was due in large part to her inability to properly enact traditional heteromasculine scripts necessitated by the military. As Mia Fischer explains, "Manning's lack of such patriotic devotion and her 'ultimate betrayal' of the homeland and (both hetero- and homonormative)

[72] Susan Stryker and Paisley Currah, "Introduction," *TQS: Transgender Studies Quarterly* 1.1-2 (2014): 2.
[73] For analysis of media discourse on Manning, see Fischer, *Terrorizing Gender*. For an analysis of legal discourse in the Manning case, see Beauchamp, *Going Stealth*.
[74] Spade and Willse, "Sex, Gender, and War in the Age of Multicultural Neoliberalism," 16.

whiteness, meant that she was ostracized as the alien enemy" and thus deserving of extrajudicial violence.[75] That is, her whiteness—which had previously enabled her to serve in the military and leak classified documents without being subject to excessive scrutiny—had suddenly been called into question by her display of unpatriotic critique of US exceptionalism and the exercise of imperial warfare around the globe. In turn, Fischer continues, "Manning's case elucidates how the neoliberal US. security state strategically replaces the primacy of whiteness solely as phenotype with a manifestation of whiteness through the logics of heteronormativity and its commitment to furthering imperialist U.S. foreign policy."[76] And yet, while Manning was placed in proximity to those racialized others that haunt the post-9/11 state security apparatus, her phenotypic whiteness nonetheless positioned her as exceptional to the forms of violence exercised within the carceral archipelago of US imperialism, for example in Guantánamo Bay, which was one of the main subjects of the leak. In contrast to Fischer, Toby Beauchamp suggests that if "Manning can be depicted as a singular case [this is] not solely because her whistle-blowing or transgender identity make her different, but also because whiteness offers a claim on individuality not readily available to people of color."[77] In effect, Manning's transgender identity, and thus her fitness for heteromasculine and homonationalist discourses of security, was negotiated by an unmarked whiteness that impacted to what extent she became labeled as a traitorous figure or as an exceptional victim distinct from a background of racialized others.

My point in reviewing Manning's case in detail is to demonstrate how her identity was constantly being reworked in the public imagination as a contested terrain upon which the US neoliberal security state attempted to makes sense of her actions as a whistleblower. To be sure,

[75] Fischer, *Terrorizing Gender*, 67.
[76] Fischer, *Terrorizing Gender*, 41.
[77] Beauchamp, *Going Stealth*, 127.

at no point during her trial and incarceration could Manning's identity be made unproblematically visible without being mediated by the racialized gendered formations of state militarism. By manipulating her genetic profile, *Probably Chelsea* thus visually reflects and reinforces how Manning's identity was variously engineered within the social technics of the US security apparatus. Through the process of DNA phenotyping, she appears in the many probable guises conferred to her by the court, the military, the media, and the public—guises no less real than the unreality of her trans identity caught in the crosshairs of the American surveillance state. And yet, throughout all this, Manning is conspicuously missing. Neither does any single predictive portrait present itself as an index of her identity nor are we given access to the algorithmic heat maps that rendered such faces possible in the first place. In this case, by obscuring the technical dimensions DNA phenotyping, the installation yokes the production of identity upon the public's ability to recognize Manning as a figure displaced from certain forms of racialized and gendered alterity that haunt the US security state. At the core of this displacement is the unmarked whiteness of Manning's trans identity that both enables the genetic variation in DNA phenotyping on a technical level, as well as the way that audiences accept such variations as probable instances of Manning's genetic profile on an aesthetic level.

To be clear, this is not to suggest that Dewey-Hagborg's collaborative work with Manning aspires to the same program of heteropatriarchal and white supremacist militarism that shaped discourse around Manning's case. Rather, I argue that what critiques of Dewey-Hagborg's work miss in upholding the disruptive potential of the any-face-whatever is how identity is already rendered malleable within the neoliberal logics of the security state. As Manning's case exhibits, such logics have the capacity to reorganize identity around the phenotypic and performative dynamics of whiteness in order to produce boundaries of security

and disposability as needed in order to maintain the exceptional status of the state. Perhaps, then, what is interesting about *Probably Chelsea* is not so much that it reveals how DNA phenotyping can manufacture any-face-whatever through algorithmic operations. Rather, by reproducing the ubiquity effects of genetic prediction tools on a visual level, the installation rhetorically demonstrates the normative force of the aorist in upholding the social technics of the neoliberal security apparatus. Put differently, by obscuring the technical basis of DNA phenotyping behind Manning's malleable identity, *Probably Chelsea* stages how the technical and aesthetic dimensions of the aorist can be instrumentalized to produce the precise differences of racial, gendered, and sexual identity demanded of the body by the logics of whiteness and heteropatriarchy central to state security. Paradoxically, Dewey-Hagborg uses DNA phenotyping to expose all the versions that Manning is probably not but is made to be according to the retrospective processes of surveillant power.

*The Database of Tomorrow*

In an ideal world, DNA phenotyping would not exist. This is not because the technology is faulty or rife with racial bias. Rather, from the perspective of the security state and its manifold institutions of criminal justice and counterterrorism, DNA phenotyping is simply a temporary substitute for a more ubiquitous future of genetic surveillance. We see this, for example, with respect to current debates on universal DNA databases in the United States.[78] In order to prevent criminal activity, some policymakers, forensic scientists, and law enforcement agencies advocate for the construction of federal databases that contain DNA samples of every single person in the nation. DNA recovered from a crime scene could then be directly matched to

[78] On the legal framework of universal DNA databases, see Krimsky and Simoncelli, *Genetic Justice*, xvi.

genetic profiles in the database using traditional STR techniques. To be sure, universal DNA databases are mired with privacy issues and other data ethics concerns. We might question, for example, for what other purposes genetic profiles can be used, including determining who gets health insurance or access to public housing, in addition to whether or not DNA samples would be collected with informed consent or surreptitiously through dragnet operations.

Technologies of ubiquitous genetic surveillance of course have long been fodder for various science fiction imaginaries—like in the films *Gattaca* (dir. Andrew Niccol, 1997) and *Platinum Data* (dir. Keishi Otomo, 2013)—that warn of the eugenicist perils of genetic engineering and of the possibilities for total biometric surveillance that aim to determine when criminal activity might occur. And yet, these speculative futures are not too far off. While for the moment universal DNA databanks are hypothetical scenarios, in the United States criminal investigators already have access to a national database of genetic profiles in CODIS, which by October 2021 had over 20 million entries for incarcerated persons convicted of crimes, suspects taken into custody but not formally charged with an offense, and immigrants and asylum seekers detained by border enforcement agencies.[79] This is notwithstanding databases managed on local and state levels in addition to the innumerable public and private databases that contain tens of millions of patient and consumer profiles. Other countries like the United Kingdom, Kuwait, and Saudi Arabia have likewise considered universal databases of their own as new security initiatives in order to curtail crime and terrorist activity.[80] China is the leading global superpower in genetic surveillance with upwards of 140 million profiles in its genomic dataset around 2020—a dataset which, while expanded to the entire country, largely targets Tibetans and

[79] Federal Bureau of Investigations, "CODIS-NDIS Statistics," last updated October 2021, https://le.fbi.gov/science-and-lab-resources/biometrics-and-fingerprints/codis/codis-ndis-statistics.
[80] J. W. Hazel, et. al, "Is it time for a universal genetic forensic database?," *Science* 362.6417 (2018): 898-900.

Uyghur Muslims in order to advance China's oppressive authority over ethnic minorities.[81] Notwithstanding glaring ethical and privacy issues, attempts to construct universal DNA databases gesture to the hidden futures of ubiquity that underpin contemporary developments in genetic surveillance, often with the goal of discriminating against select populations based on erroneous biological assumptions about race and ethnicity. Within these futures of ubiquitous genetic surveillance, DNA phenotyping would be obsolete since there would no longer be a need to predict what can simply be confirmed with a simple database match.

What then might the aorist reveal about the speculative futurity of ubiquitous genetic surveillance? In the anticipatory wake of ubiquity, we have now the aorist, a form of retrospective prediction through which DNA phenotyping products like Snapshot fabricate facial morphology, skin color, and racial and ethnic affiliation by reconstructing an unlived ancestral past. And yet, if DNA phenotyping is merely a temporary substitute for a more ubiquitous future of genetic surveillance, does this mean that the aoristic similarly pales in comparison to the more robust and accurate future-oriented predictive techniques that we find in technologies like universal DNA databases? While it remains to be seen how aoristic methods of computational analysis might be deployed in novel data-based surveillance technologies (like in predictive policing), for the moment we witness how the technical and aesthetic form of the aorist emerges as a defining hallmark of the neoliberal security state insofar as it can produce any identity needed to maintain the status of whiteness within preemptive measures. And yet, just as much as the aorist consolidates the social technics of security within spatiotemporal arrangements of data,

[81] Emile Dirks and James Leibold, "Genomic surveillance: Inside China's DNA Dragnet," Australian Strategic Policy Institute, 2020, https://www.aspi.org.au/report/genomic-surveillance. The Chinese government's DNA dataset has largely been constructed without informed consent of individuals and in partnership with biotech companies including the US-based company Thermo Fischer Scientific and a dozen other Chinese companies, including AGCU Scientific, Forensic Genomics International, Microread Genetics and Highershine.

it likewise lays bare how every prediction is nonetheless grounded upon the invocation of an unstable past. In this way, the aoristic shrewdly reveals the temporal fictions that underlie the production of ubiquity as a medial effect in surveillance technologies.

# CHAPTER 3

Targeting Electromagnetism: On Dispersion in Through-the-Wall Sensors

As remote sensing systems have become increasingly commonplace in public and private sectors, walls have remerged as a site of technological possibility, material enchantment, and cultural anxiety. Consider, for example, the mobile phone attachment from the Israeli company Vayyar (which translates from Hebrew to "to see") that allows one to peer through walls.[1] Adapted from a radar imaging system previously used for breast cancer detection, the device can visualize hidden objects like wires and beams inside walls. But Vayyar also pitches the technology as a smart home sensor that can act as a security system to alert authorities about possible intruders or whether someone in another room has unexpectedly collapsed. Elsewhere, university researchers are developing sensors that use Wi-Fi signals to detect human figures through walls (including behavioral activities like gait as well as emotions indexed by heartbeat and breathing patterns), while others suggest that Wi-Fi could be used for unwanted surveillance in domestic spaces.[2] In commercial applications, automated car systems deploy similar radio frequency technology to detect pedestrians and cyclists around corners, while businesses and entertainment industries use Bluetooth beacons to target the mobile devices of potential customers to bring them inside stores.

[1] Spencer Kelly, "Radar sensor for the home which can 'see' through walls," *BBC*, 17 Jan 2017. Accessed 30 Nov 2020. https://www.bbc.com/news/av/technology-38608135.
[2] Fadel Adib, et al, "Capturing the Human Figure Through a Wall," ACM Special Interest Group on Computer Graphics and Interactive Techniques, 2015, http://rfcapture.csail.mit.edu/rfcapture-paper.pdf; Mingmin Zhao, Fadel Adib, and Dina Katabi, 'Emotion Recognition using Wireless Signals," *International Conference on Mobile Computing and Networking*, 2016, https://doi.org/10.1145/2973750.2973762; Yanzi Zhu, et al, "Et Tu Alexa? When Commodity WiFi Devices Turn into Adversarial Motion Sensors," Network and Distributed Systems Security Symposium, 2020, https://dx.doi.org/10.14722/ndss.2020.23053.

What connects all of these technologies is the ability of electromagnetic radiation to penetrate through walls and other elements of the built world. In fact, all of these systems can be understood more generally as examples of through-the-wall sensors (TWS). Classed by the Federal Communications Commission as "intentional radiators," TWS are a suite of radar devices that exploit signal phenomenology to perceive environments on the opposite side of a barrier—or to see through walls. Such is possible because of the microphysical properties of electromagnetic radiation. Unlike light waves, radio waves have longer wavelengths (i.e. lower frequencies), which allows them to pass through solid matter. This fundamental characteristic of radio signals enables TWS to detect movement and send information through barriers even when direct visual access is restricted. Thus, while walls had previously intercepted movement and obstructed vision, they seem to have all but vanished in what critical designer Anthony Dunne identifies as "hertzian space"—that immaterial flux of electromagnetism that permeates seemingly every crevice of the built and natural world.[3] To be sure, the contemporary world is one of ubiquitous radiation: cell towers, mobile wireless devices, RFID tags, climate sensors, smart cities, television antennae, satellite beams, radio transmissions, 5G networks, and drone swarms all partake in dense fields of electromagnetic energy, fabricating a "signal space"[4] or "protocological surround"[5] that both envelops and permeates human and non-human matter alike. Within this pervasive electromagnetic terrain, objects "literally dematerialize into radiation," emerging as permutations of "wavelength, frequency, and field strength arising from

[3] Anthony Dunne, *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design* (Cambridge: MIT Press, 2005), 104.
[4] Shannon Mattern, *Code and Clay, Data and Dirt: Five Thousand Years of Urban Media* (Minneapolis: University of Minnesota Press, 2017), 35.
[5] Gillian Fuller and Ross Harley, "The Protocological Surround: Reconceptualizing Architecture in the Wireless City," in *From Social Butterfly to Engaged Citizen: Urban Informatics, Social Media, Ubiquitous Computing, and Mobile Technology to Support Citizen Engagement*, ed. Marcus Froth, Laura Forlano, Christine Satchell, and Martin Gibbs (Cambridge: MIT Press, 2011), 40.

interaction with the natural and artificial landscape."[6] Hertzian space is thus a world of total transparency, in which electromagnetism disappears all walls, barriers, borders, and bodies in search of what lies beyond and within.

And yet, despite its apparent ubiquity—or perhaps because of its ubiquity—electromagnetic radiation is never evenly distributed or experienced. Rather, as a number of media scholars suggest, electromagnetism emerges within dense nodal points of power that mediate human and non-human relations across vectors of social, political, economic, and geographic difference.[7] This is perhaps most apparent when electromagnetism is deployed as a medium for state violence, especially in the context of war. The electromagnetic spectrum has long been a key site for US imperial militarism since the introduction of two-way radio in the early 1900s, now being deployed for a range of practices like satellite imaging, aeronautical and maritime navigation, precision guided munition, unmanned aerial systems, meteorological satellites, land mobile robotic radio, and much more.[8] As stated in a recent Congressional Research Service report: "Nearly every modern weapons system—such as those used by airplanes, satellites, tanks, ships, and radios—depends on the spectrum to function. The military uses applications across the electromagnetic spectrum to support communications, situational

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[6] Dunne, *Hertzian Tales*, 101.

[7] For example, while cellular towers claim to provide universal coverage through honeycomb-shaped networks of hexagonal cells, urban and rural terrain is never completely uniform, thus creating areas of overlap and air-gapped pockets that connect some and disregard others. As Shannon Mattern argues, "just as with early radio broadcast, the city itself presents physical obstructions, and its volume of users can overtax the network. Network architects have to negotiate between the idealized 'cell' architecture, the not-so-geometrically-uniform urban terrain, and the potentially variable user demand in order to calibrate their installations – to determine where to place base stations, and how many to put there." *Code and Clay*, 34. See also Jennifer Gabrys, *Program Earth*; Mél Hogan, "Data is airborne; Data is inborn: The labor of the body in technoecologies" *First Monday* 23.3-5 (2018), https://firstmonday.org/ojs/index.php/fm/article/view/8285; Adrian Mackenzie, *Wirelessness: Radical Empiricism in Network Cultures* (Cambridge: MIT Press, 2010); William Mitchell, *Me++: The Cyborg Self and the Networked City* (Cambridge: MIT Press, 2003); Rahul Mukherjee, *Radiant Infrastructures: Media, Environment, and Cultures of Uncertainty* (Durham: Duke University Press, 2020).

[8] US Government Accountability Office, "Spectrum Management: Federal Relocation Costs and Auction Revenues," GAO-13-472, May 2013, https://www.gao.gov/assets/gao-13-472.pdf.

awareness, military operations, and emerging technologies."[9] What we find here is a belief in electromagnetism as a pervasive and unrelenting source of ubiquitous visibility, control, and domination. This is more broadly consistent with the Department of Defense's attempt to achieve "full spectrum dominance" as a configuration of imperial violence aimed at expanding US military superiority and establishing government regimes beholden to American policy.[10]

In this chapter, I examine how the technological arrangement of TWS expand upon the militarization of electromagnetic radiation in sites of imperial war-making. In doing so, I argue that TWS—whether in commercial, public, private, or military contexts—articulate a version of ubiquity predicated upon modes of control and dominance through visibility. However, TWS are unique among other kinds of military radar technologies like satellites or drones insofar as they do not assume free-space conditions for the propagation of their signal. While most radar technologies treat walls and other objects as obstacles that inhibit the movement of a signal, TWS acknowledge that its signal by design must interact with a wall at the very onset of its propagation. The wall is neither ancillary nor obstructive, but instead a key material agent that disperses the signal prior to engaging with objects in the targeted environment. Dispersion refers to the bending and spreading of waves (including electromagnetic radiation, light, water, sound) when passing from one medium into another medium, thus producing microphysical differences in frequency, speed, and wavelength. Electromagnetic waves in particular are subject to amplitude and phase distortions due to the dispersive properties of a given medium.[11]

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[9] John R. Hoehn, Jill Gallagher, and Kelley Sayler, "Overview of Department of Defense Use of the Electromagnetic Spectrum," Congressional Research Service report, R46564, August 10, 2021, https://sgp.fas.org/crs/natsec/R46564.pdf, 4

[10] For a fuller account the "new imperialism" that emerged in the post-9/11 moment as a response to decades of teetering American power on the global stage, see Rahul Mahajan, *Full Spectrum Dominance: U.S. Power in Iraq and Beyond* (New York: Seven Stories Press, 2003).

[11] Ali Hussein Muqaibel, M. A. Alsunaidi, Nuruddeen Mohammed Iya, and Ahmad Safaai-Jazi, "Wall Attenuation and Dispersion," in *Through-the-Wall Radar Imaging*, ed. Moeness Amin (Boca Raton: CRC Press, 2011), 1.

Why might such a claim about dispersion matter for our understanding of the sociotechnical dimensions of ubiquity? For some digital media scholars, properties of signal loss are regarded as a critical rejoinder to claims of ubiquitous surveillance afforded by military radar technology. In her study of satellites within projects of US imperialism, Lisa Parks for example argues that a "diffractive position" might contest the military's claim "to have the power to see, know, and destroy everything."[12] Diffraction here refers to the process by which a waveform is spread out as a result of passing through a narrow aperture or across an edge. For satellites, diffraction might occur when a radar signal interacts with a small hole in a building's ceiling or the top of a mountain, spreading out and perhaps not returning to the receiver in a calculated path. However, by adopting diffraction as a reading practice or aesthetic attunement to radar technologies, Parks argues that we might instead interrupt the uniformity of state optics, ultimately acknowledging that "some things cannot simply be seen and destroyed."[13] And yet, while diffraction might be a particularly disruptive hermeneutic in radar technologies like drones and satellites, signal propagation effects are built into TWS as a technical precondition for visualizing concealed space and detecting targets. Here, microphysical properties like dispersion actually consolidate surveillant power rather than disrupt it. By examining the technical and aesthetic qualities of dispersion underpin TWS, I thus aim to trace another way in which imperial power is consolidated in the ubiquity effects of electromagnetic surveillance.

In order to examine how dispersion underlies claims to ubiquity within US imperial optics, in what follows I examine TWS specifically as they are used in sites of militarized

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[12] Lisa Parks, *Rethinking Media Coverage: Vertical Mediation and the War on Terror* (New York, London: Routledge, 2018), 121.

[13] Parks, *Rethinking Media Coverage*, 121. Such thinking echoes Karen Barad's theorization of diffraction within her writing on quantum physics. Unlike reflection which reproduces waveforms through "geometries of sameness," diffraction is "a tool of analysis" for becoming attuned to "differences that our knowledge-making practices make and the effects they have on the world." Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007), 72.

conflict. In the first section, I track how TWS were developed, tested, and deployed in the US invasion of Iraq and Afghanistan in the War on Terror. In doing so, I place TWS within a broader set of radar technologies like drones and satellites that remediate US imperial power through techniques of electromagnetic propagation and detection. However, by focusing specifically on the DARPA project VisiBuilding, I detail how TWS are unique from other forms of radar technology insofar as they incorporate effects like signal dispersion into their design in order to detect targets beyond walls. In the following section, I focus on a set of commercially available handheld TWS devices called the Xaver series to demonstrate how dispersion is both a technical and aesthetic form that brackets claims to visibility. In this case, dispersion registers how TWS detect various kinds of matter—both human and non-human—as targets through a series of mediations that scale across the microphysical properties of electromagnetic signals, the built environment, and the operator. Finally, I turn attention to visual representations of TWS in order to demonstrate how these devices are imagined to operate as technologies of counterinsurgency. Rather than accurately convey how TWS operate in the field of combat, such representations instead reveal the technics of racialized and gendered difference that underlie dispersive processes of ubiquitous surveillance in US imperial space.

*Through-the-Wall Sensors and Electromagnetic Warfare*

TWS were originally developed in the 1990s as researchers in universities, private institutes, and military centers began to apply ground radar techniques to reconstruct the interior of architectural structures.[14] Contemporary TWS systems however are designed not only to

[14] Lawrence Frazier, "Surveillance through walls and other opaque materials," Proceedings of the IEEE National Radar Conference Electronic Systems (1996): 27-31; David Ferris and Nicholas Currie, "A survey of current technologies for through-the-wall surveillance (TWS)," Proceedings of the SPIE Conference on Sensors, C31 Information, and Training Technologies for Law Enforcement 3577 (1998): 62-72; Eugene Greneker, "RADAR

visualize hidden space, but also locate obscured objects, like human bodies, within those environments. TWS operate by deliberately emitting an electromagnetic signal of either a single frequency or multiple frequencies from its transmission source into a wall (fig. 3.1). After passing through the wall, that signal then reflects off objects within the environment. While most of the reflected signal will continue to travel around the space, part of it will pass back through the wall and return to the device's receiver. At this point, the TWS device compares the original signal from the transmission source to that sensed by the receiver using a range of signal processing algorithms. Through differences in frequency, speed, amplitude, and other variables, the device is ultimately able to determine the proximity of objects in relation to the wall, as well as their size, material composition, and relative movement. TWS typically come in two different types: at-the-wall (ATW) and stand-off (SO). While ATW systems must be held against the wall to eliminate gaps in front of the device, SO systems can typically be installed up to thirty meters from the structure.

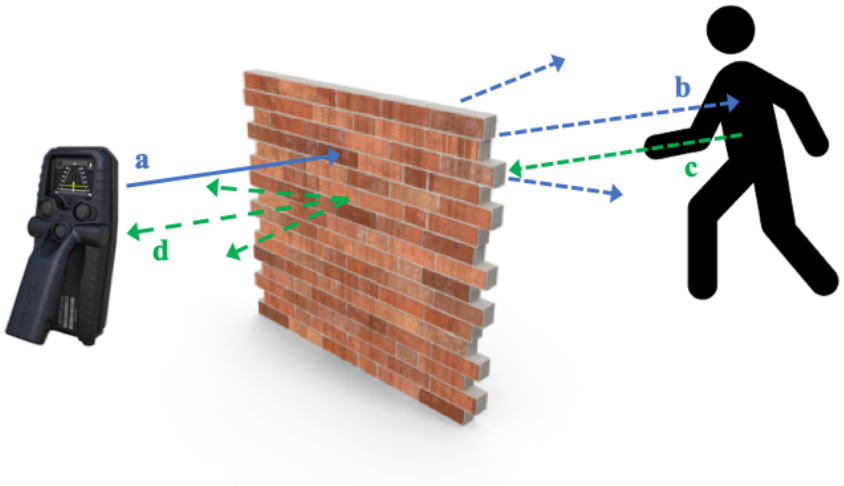


Fig. 3.1: A diagram of a through-the-wall sensor deployed to detect the movement of a person walking on the opposite side of a brick wall. The initial propagated signal (a) first encounters the brick wall. The wall disperses the signal (b), which scatters in multiple directions. Part of the dispersed signal encounters the target, whose body reflects the signal (c) back towards the wall. The wall disperses the signal a second time (d), a part of which then

flashlight for through-the-wall detection of humans," Proceedings of SPIE on Targets and Backgrounds 3375 (1998): 280-285.

returns to the device's built-in receiver. Dotted lines show the increasing dispersion of the signal when passing through the wall at two separate moments. Diagram by author.

In general, TWS are intended to detect movement behind barriers based on the reflected signal. However, the kind of information presented to the operator depends on the type of electromagnetic signal that the device propagates, the signal-processing algorithms used to interpret the reflected signal, and the image-processing algorithms used to reconstruct the obscured space and objects within it. The resulting information thus varies. In simple devices, TWS provide only an indication that movement is detected with a flashing light. In other cases, devices can present a one-dimensional graphic display that shows the relative proximity of a single target in relation to the wall. More advanced systems provide a two-dimensional or three-dimensional layout of the room that tracks multiple targets over time. However, despite differences in the kinds of information presented to the operator, TWS overall are designed to detect a wide range of movements, including those that take place over a large area or span of time like a human walking or those that are slight and highly repetitive like the contraction of a chest caused by breathing or a heartbeat. Indeed, their ability to detect heartbeats and subtle breathing have made them highly applicable technologies for paramedics, fire fighters, and other first responders. In several reports published over the first two decades of the twenty-first century, TWS have been identified by the National Institute of Justice and the Department of Homeland Security as necessary tools for engaging in rescue missions and disaster relief efforts.[15] Not surprisingly, police and federal agencies have also deployed TWS—in particular

[15] In 2007, the National Institute of Justice called TWS "a new technology for saving lives" while in 2019 the Department of Homeland Security lauded TWS for their "portable signs of life indication capabilities." Christopher Miles, "Through-the Wall Surveillance: A New Technology for Saving Lives," *National Institute of Justice*, October 1, 2007, https://nij.ojp.gov/topics/articles/through-wall-surveillance-new-technology-saving-lives.; Department of Homeland Security, "Radar Systems for Through-the-Wall Surveillance Market Survey Report," September 2013, https://www.dhs.gov/sites/default/files/publications/Radar-TWS-MSR_0913-508.pdf.; Department of Homeland Security, "Portable Signs of Life Identifier: Technology Scouting Research Summary," August 2019, https://www.dhs.gov/sites/default/files/publications/portable_signs_of_life_updated-508c_v3.pdf.

the Range-R from L-3 Communications—at least since the early 2010s for tactical operations and rescue missions in order to enhance situational awareness in those scenarios where a suspect is hiding, a hostage is held captive, or where lack of entry is denied.

Prior to their deployment by first-responders and law enforcement, however, TWS were developed and tested as key military surveillance technologies in sites of armed conflict, especially in the War on Terror following the attacks on 9/11. In this context, TWS were celebrated as key technologies for Homeland Security initiatives, as well as for US military operations in Iraq and Afghanistan.[16] Such systems include both handheld devices as well as large-scale systems designed to image the interior of entire buildings. For example, in the months following the attacks, the Department of Defense swiftly invested in the development of SoldierVision, a device designed to construct a two-dimensional color display that can reveal hidden bodies and possibly weapons.[17] In 2006, DARPA introduced Radar Scope for in-theater evaluation, which they described as "a quick-response effort to provide pre-production prototypes of a hand-held through-wall personnel detection radar."[18] By 2010, the military was actively testing a range of other TWS devices, including L3-Cyterra's Range-R2D, TiaLinx's Eagle Scanner, and Raytheon's InSight. By far the most advanced DARPA-funded TWS system introduced in the post-9/11 moment was the VisiBuilding program, which promised "to detect personnel within buildings, to determine building layouts, and to locate weapons caches and shielded enclosures within buildings."[19] Composed of a set of signal propagation and detection

[16] Stanley Borek, "An Overview of Through the Wall Surveillance for Homeland Security," *Proceedings of the 34th, Applied Imagery and Pattern Recognition Workshop* 1(2005): 42-47.
[17] John McHale, "Time Domain through-wall surveillance radar aids in counter-terrorism and urban warfare," *Military & Aerospace Electronics*, Dec 1 2001, https://www.militaryaerospace.com/communications/article/16710632/time-domain-throughwall-surveillance-radar-aids-in-counterterrorism-and-urban-warfare.
[18] DARPA, "DARPA Fact File: A Compendium of Programs," Department of Defense, June 2008, 16.
[19] DARPA, "DARPA Fact File," 16.

devices that could be handheld, free-standing, or attached to vehicles, VisiBuilding was designed to scan structures and produce an accurate model of the building's interior. Moreover, it could enable surveillance of multiple buildings and vehicles at once. According to DARPA Program Manager Edward Baranoski, by equipping three UAVs with multipath exploitation radar, the US military could "provide persistent wide area tracking of vehicles in a metropolitan area like Baghdad."[20] Ultimately, VisiBuilding and other TWS promised to aid US military personnel in urban raid missions in Iraq and Afghanistan by providing them complete situational awareness in complex environments in which enemies might evade traditional line-of-sight technologies.

In the context of the War on Terror, SoldierVision, Radar Scope, VisiBuilding, and other military-funded TWS devices functioned as key technologies for American imperial war-making rooted in ideals of transparency and dominance. To be sure, the primary aim of TWS is to make visible what is otherwise obscured or hidden in the theater of war as objects of threat. Such is consistent with what Michel Foucault calls "subjection by illumination" in which various kinds of strategies, tactics, and techniques of visibility give material form to power by rendering spaces and bodies legible for surveillance.[21] Drawing from Foucault, Lisa Parks considers how the US military's project of transparency in the War on Terror articulated a particular form of imperial power called "vertical hegemony," which entails the quest for total control over the vertical field, including terrestrial, aerial, spectral, and orbital domains. As defined by Parks, vertical hegemony "is undergirded by the assumption that controlling orbit, air, and spectrum is tantamount to controlling life on Earth. By controlling these vertical domains, a state can monitor sovereign territories from above, transmit signals across national borders, and strike targets on

[20] Edward Baranoski, "New Sensor Signal Processor Paradigms: When One Pass Isn't Enough," High Performance Extreme Computing Conference 2008, Sept 23-25, https://archive.ll.mit.edu/HPEC/agendas/proc08/Day1/3-Baranoski-Presentation.ppt
[21] Michel Foucault, *Power/Knowledge* (New York: Vintage, 1980), 154.

the earth's surface."[22] As a version of ubiquitous surveillance, vertical hegemony reflects how aerial observation operates as an "instrument of war" within legacies of colonial rule and imperial conquest.[23] We might look no further than the American military's use of the electromagnetic spectrum to launch UAV airstrikes in the 1991 Gulf War and intercept and block enemy airwaves in the Balkan Wars of the 1990s to witness how electromagnetic technologies became key to the expansion of imperial power. As Paul Virilio argues, the military's investment in the electromagnetic spectrum in these conflicts marked a shift from a "ground offensive" to an "aero-orbital offensive."[24] Within this militarized "Hertzian ecosystem," the US sought not only to eliminate the death of American troops through remote electromagnetic attacks, but also to inaugurate its own "global information dominance" through the permanent presence of satellites that could gather and transmit information in real-time.[25]

Importantly, verticality does not only refer to forms of surveillance and domination from above like satellites and drones. Eyal Weizman and Stephen Graham both observe that verticality is a geopolitical form that is always performed in relation to specific conditions on the ground, in turn transforming landscapes of urban infrastructures and even subterranean spaces where enemies are thought to seek refuge.[26] Indeed, not only does electromagnetic radiation extend

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[22] Parks, *Rethinking Media Coverage*, 3.
[23] Caren Kaplan, *Aerial Aftermaths: Wartime from Above* (Durham: Duke University Press, 2018), 31.
[24] Paul Virilio, *Strategy of Deception*, trans. Chris Turner (London: Verso, 2007), 51. In many ways, Virilio's argument hinges upon an explicit periodization of militarized electromagnetic technologies in the 1980s and 1990s. However, earlier forms of electromagnetic warfare took place in WWII and the Cold War. Of particular importance too is the development of electronic technologies in the Vietnam War. As Ian Shaw observes in his history of drone warfare, "The Vietnam War was a technologically intensive conflict fought with sophisticated electronic prosthetics, from remote sensors that listened to enemy movements to jet-powered Firebee drones that screamed through the skies. A gigantic electromagnetic dome was slowly erected by the U.S. military over Vietnam, Laos, and Cambodia." Ian G. R. Shaw, *Predator Empire: Drone Warfare and Full Spectrum Dominance* (Minneapolis: University of Minnesota Press, 2016), 71.
[25] Paul Virilio, *Strategy of Deception*, 33; 30.
[26] Eyal Weizman, "Control in the Air," Open Democracy, May 2, 2002, www.opendemocracy.net/ecology-politicsverticality/article_810.jsp. Stephen Graham, "Vertical Geopolitics: Baghdad and After," *antipode* 36.1 (2004): 12-23.

outward into aerial domains, but it is also tied to specific infrastructures of signal propagation and detection that produce "enclosures" of warfare and security across territorial space.[27] Drones, for example, remotely transform physical, emotional, and psychological landscapes by violently reconfiguring human lifeworlds within what Ian Shaw describes as "overlapping, electromagnetic, civilizatory domes" produced through an array of electro-optical and infrared sensors that detect electromagnetic radiation reflected off of or coming from the ground.[28] Such enclosures suture imperial power to capital modes of domination, expressed through the technological extraction and accumulation of data, affect, and other resources from a surplus humanity.[29] In much the same way, TWS systems like VisiBuilding and Radar Scope generate imperial enclosures of their own by explicating private domestic space—individual rooms or a whole building—as smaller-scale electromagnetic domes, in turn rendering them visible for outside intervention.

It should further be noted that while TWS extend upon geopolitical practices of US vertical hegemony used in other radar technologies like drones and satellites, the development of TWS within the War on Terror was also heavily influenced by settler colonial tactics deployed by the Israeli Defense Force in the early 2000s. As Weizman documents in his 2007 book *Hollow Land*, the IDF's practices of urban warfare were crucial for subsequent foreign military efforts in the region, including the American and British invasions and occupations of Iraq. As he explains, during Operation Defensive Shield conducted on the West Bank city of Nablus in 2002, the IDF used explosives and hammers to demolish walls, thus allowing for visibility and

[27] Ian Shaw, "The Great War of Enclosure: Securing the Skies," *antipode* 49.4 (2017): 883-906.
[28] Ian Shaw, *Predator Empire*, 46-47.
[29] Shaw argues that the emergence of our contemporary technologically-mediated warfare emblematized through drones has marked a transition in American empire "from a labor-intensive to a machine-or capital-intensive system: the Predator Empire." Shaw, *Predator Empire*, 10.

entry into domestic Palestinian spaces.[30] These tactics for "walking through walls" enabled the IDF to turn "inside to outside and private domains to thoroughfares."[31] As a kind of "inverse geometry," breaking through walls made space conform to movement, and in doing so rendered the city as "the very *medium* of warfare—a flexible almost liquid matter that is forever contingent and in flux."[32] Thus, prior to the development of VisiBuilding and other DARPA-funded devices, the IDF was already practicing a form of TWS by rendering walls as transparent interfaces, thus expanding sovereign power over Palestinian civilian life. In fact, the IDF soon adopted their own TWS devices: in 2004, the Israeli company Camero-Tech began designing handheld radar-based imaging technology that allows military personnel to detect movement inside buildings, which in turn informs soldiers where to shoot their weapons. Such practices of visibility have now culminated in the colonization of Palestinian airspace through radio antennae, satellite imagery, and drone strikes, giving Israel "a presence across the whole spectrum of the electromagnetic field" for total observation.[33]

To be sure, TWS like VisiBuilding are extensions of other practices of imperial and settler colonial visibility that use electromagnetism in order to render land, bodies, and buildings

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[30] See also Stephen Graham's account of Operation Defensive Shield as one of "urbicide," wherein the IDF not only targeted Palestinian life, but also the various infrastructures (social, welfare, economic, architectural) upon which Palestinian life relied. In this sense, cities were no longer a "spaces of civil society and of hopes for a better life for Palestinians," but instead became rendered as "mere geopolitical 'weapons' undermining the fragile territorial power of the Zionist state." Graham, *Cities Under Siege*, 227.

[31] Eyal Weizman, *Hollow Land: Israel's Architecture of Occupation* (London, NY: Verso, 2007), 185-6. Prior to this, the Stasi also surveilled citizens in East Germany by making small holes in walls. Camero documents this practice on their website as a key predecessor for their Xaver TWS: "From early 1950s to late 1980s, Stasi, the secret police of East Germany, known as the "Shield and Sword of the Party", extensively monitored their citizens. One of their methods was to drill small holes in apartments and hotel rooms, which their agents filmed the citizens through special tubes inserted in the holes in the walls. Schools, universities, and hospitals were extensively infiltrated as well. Stasi controlled the population and could easily install these means during construction or by preventing the people from being in their houses while the tubes were being installed in the walls." Amir Beeri, "The Fantasy of Seeing Through Walls – Is It Really Possible?" Camero, n.d., https://www.camero-tech.com/technology/through-wall-imaging.

[32] Eyal Weizman, *Hollow Land*, 186; italics in original.

[33] Weizman, "Control in the Air."

visible for permanent surveillance and intervention. As Weizman writes, TWS operate as "instruments of 'literal transparency'" that turn urban space into a digital terrain of ubiquitous visibility within which human life becomes perceptible and thus potentially subject to lethal force.[34] And yet, unlike other radar technologies, TWS do not function as direct line-of-sight technologies, but instead must negotiate the material limitations of the built environment in order to see beyond it. Drones and satellites, for example, employ a radar technique called synthetic aperture radar (SAR), which uses the relative movement of an antenna over a target region in order to produce an image. Importantly, SAR assumes that the medium through which the signal passes—the air—is free from obstruction and that the signal will travel undisturbed until it reaches its target destination. (Indeed, SAR takes advantage of the fact that radar of a certain wavelength can penetrate fog, rain, mist, snow, and smoke, thus not suffering from dispersive effects.) The radar receiver is then able to discern aspects of the terrain surface based on the properties of the reflected signal, including its time delay and amplitude.

By contrast, in order for a TWS device to see inside a building, it must compensate for the wall's effect on the signal *before* it even interacts with the targets environment. According to Baranoski, what made the VisiBuilding model exceptional at the time was its capacity to penetrate walls, which largely confounded traditional radar and infrared detection techniques like SAR where the attenuating effects of walls are simply ignored. As Baranoski explains, "free-space assumptions no longer apply after the electromagnetic waves propagate through the first wall […] Shadowing, attenuation, multipath, refraction, diffraction, and dispersion all play a role in how the signals will propagate after the first interface."[35] To compensate for the wall's effects

[34] Weizman, *Hollow Land*, 208-209.
[35] Edward Baranoski, "Through Wall Imaging: Historical Perspective and Future Directions," IEEE International Conference on Acoustics, Speech, and Signal Processing 2008, 5173.

on the signal, VisiBuilding devised an alternative method of signal detection and interpretation called a "model-based reasoning approach" (fig. 3.2). This method takes into account not only the physical properties of projection, but also the interactions between the signal and material elements in the built environment. After propagating a signal and sensing its reflection, VisiBuilding deploys algorithms to filter out distortions and backscatter caused by the wall itself. Next, it iteratively matches the remaining sensed data to model-based representations of complex urban structures. By continually comparing the remaining sensed data with the expected propagation results in each candidate model, the VisiBuilding program can eventually identify a "best maximum likelihood match" in real-time, thus equipping soldiers with key intelligence about the building's composition and areas where targets might be located.[36]

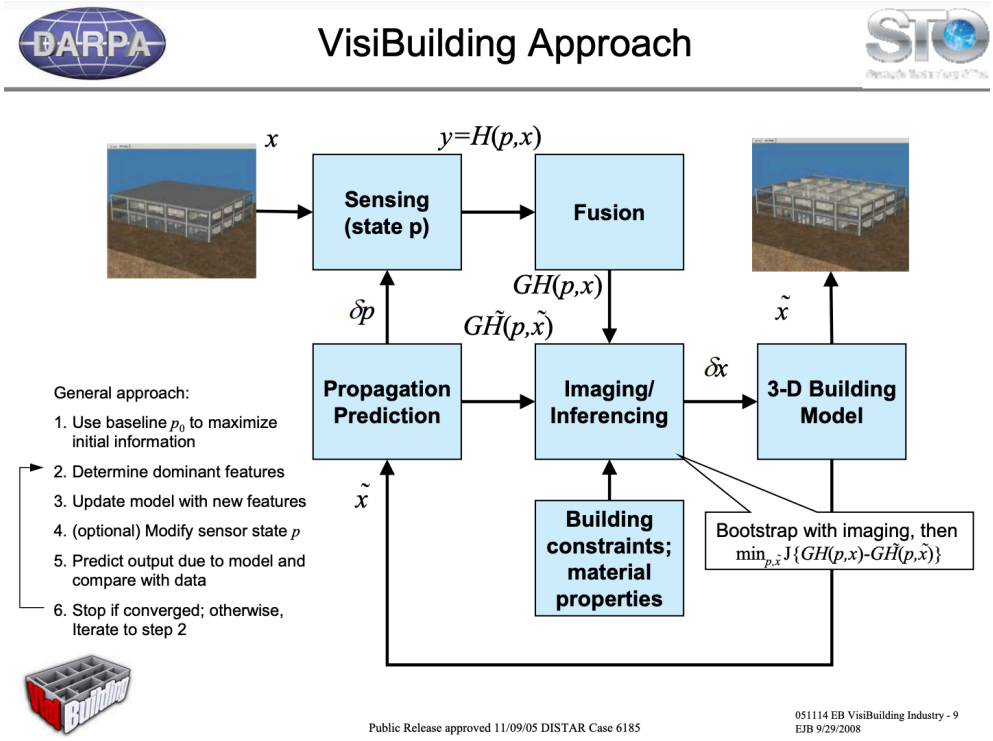


Fig. 3.2: Fig. 3: Diagram of VisiBuilding's model-based reasoning approach that continuously updates its predictive output by comparing sensed data with pre-determined propagation effects and features of various building templates. Image from Edward Baranoski, "New Sensor Signal Processor Paradigms: When One Pass Isn't Enough," High Performance and Embedded Computing 2008. Available at: https://archive.ll.mit.edu/HPEC/agendas/proc08/Day1/3-Baranoski-Presentation.pdf. Accessed March 1, 2023.

[36] Baranoski, "Through Wall Imaging," 5174.

Through its model-based approach, VisiBuilding attempts to see inside buildings by drawing a correlation between sensed data and prefabricated models that include information about propagation effects within various architectural forms. In doing so, it gestures to the centrality of signal propagation effects like dispersion as principal technical components within TWS. Rather than ignore wall interference or treat it as an obstacle to overcome, VisiBuilding exploits such signal effects in order to visualize architectural interiors. At work here is a form of data visualization premised upon the microphysical properties of electromagnetic radiation within complex multipath environments to which there is no direct line-of-sight. Thus, while such propagation effects are considered to be an impediment for other technologies of electromagnetic surveillance like satellites or drones in open space environments, for TWS they are both necessary and productive for detecting targets beyond walls and for identifying possible threats. Microphysical properties like dispersion thus enable, rather than inhibit, the achievement of transparency within larger practices of imperial power

*The Microphysics of Dispersion*

In this section, I turn specifically to scientific studies and technical reports of contemporary handheld TWS devices in order to explore how dispersion is configured as a microphysical property within the radar technology. In doing so, I conceive of dispersion not only as a technical form within TWS, but also an aesthetic one that subtends the ability to see beyond walls. As an aesthetic form, dispersion underpins how TWS detect targets through various levels of interpretation, both on the part of the device itself and the operator, in order to compensate for signal loss caused by the built environment. In this case, dispersion reveals

transparency to be an achievement of various signal and image processing algorithms that construct an object's presence based upon the material properties of electromagnetic radiation.

In particular, I focus on the Xaver series from Camero, the Israeli-based global defense company that began equipping the IDF with TWS in the early 2000s and has continued to do so throughout the twenty-first century for use in Gaza and Lebanon.[37] Owned by the South Korean defense technology conglomerate SK Group, Camero is now a top global supplier of TWS devices, having sold the Xaver series to more than fifty foreign governments for use by military, police, and first responders. In particular, Camero is the primary supplier of TWS for US security operations. In a 2012 strategic report from the Washington Institute for Near East Policy, the Xaver series is identified as a significant Israeli-based technology that is helping to address "the hard security challenges of the future and in preserving the competitiveness of the U.S. defense-industrial base."[38] In this context, the Xaver series emerges as a paradigmatic emblem of the ongoing political alliance between the US and Israel since the 1960s wherein Israel has played a key role in expanding US imperialism in the Middle East, including the occupation of Iraq and Afghanistan and the colonial rule and ethnic cleansing Palestine.

The Xaver series consists of a suite of seven TWS devices. For the present purposes, I focus only on three—the Xaver 100, 400, and 800—as these are the primary devices that have been tested by US federal agencies for use by military and law enforcement.[39] Importantly, aside from the ability to visualize targets in one-, two-, or three-dimensions, each device operates in multiple modes that allow for automatic target detection using signal-processing algorithms or a

[37] Andrew White, "In the City: Urban Terrain Awareness," *Digital Battlespace* 8.3 (2016): 10-15.
[38] Michael Eisenstadt and David Pollock, "Asset Test: How the United States Benefits from Its Alliance with Israel," Washington Institute for Near East Policy, Strategic Report 7, September 2012, https://www.washingtoninstitute.org/media/3216?disposition=inline.
[39] The other devices include the Xaver 1000, the Xaver LR40, the Xaver LR80, and XaverNet.

historical view of the distance and relative strength of the reflected signal that requires operator interpretation. The Xaver 100 is a portable handheld device that can indicate a single target's presence and movement in a one-dimensional vector. It operates in two modes: Normal, in which the interface shows a human stick figure icon in a one-dimensional plane to indicate a single target's distance from the device; and Expert, in which the device shows the distance and relative strength of the reflected signal along a single vertical line over time and allows for identification of multiple targets. The Xaver 400 is a compact handheld device that tracks multiple targets in a space and their movement over time in a two-dimensional grid. It operates in three modes: Tracker, in which the device attempts to detect and identify potential targets by representing them as squares in a two-dimensional grid; Expert, in which the device indicates where all movement is detected but not does attempt to identify which reflected sources are potential targets; and High Penetration, in which the device sacrifices the two-dimensional grid and simply reports the distance from the device of the reflected signal over time. Finally, the Xaver 800 is a free-standing radar that can provide a three-dimensional layout of a room with static and living objects. Like the 400, it operates in three modes, but differs primarily in representing targets as floating colored blobs in three-dimensional space, rather than squares in two-dimensional space.

Despite their primary differences, all Xaver TWS are examples of ultra-wideband (UWB) devices.[40] UWB devices propagate an extremely short pulse, usually a nanosecond in duration,

[40] There are three primary types of TWS devices. In addition to UWB, there is also continuous wave (CW) and pulse wave (PW). A CW device emits a signal characterized by a continuous wave of a single frequency without pulse or breaks. When reflected, that signal will return to the receiver with a slightly different frequency, which allows the device to compute the relative distance and movement of the object. ASTIR (AKELA Standoff Through-Wall Imaging Radar) by AKELA is an example of a device that operates in a stepped frequency, continuous wave mode. This means that the device emits a pure, unmodulated signal for a set amount of time, and then repeats that process on a different frequency for a total of two hundred successive iterations. Using four antennae, the device can not only detect individual targets, but also has cross-range resolution, which means it can detect the presence of multiple objects at the same range without having to move the system to another location. The graphical interface for the ASTIR system displays a two-dimension spatial grid of the environment beyond the wall.

that contains a range of wavelengths between 3.1–10.6 GHz. This quality of UWB allows for TWS to negotiate the tradeoff between attenuation and resolution. Lower frequency waves pass through walls more easily but don't provide high resolution. By contrast, higher frequencies waves cannot pass through walls as easily, but offer superior resolution. By using a wide range of frequencies, UWB devices guarantee that at least a portion of the wavelengths will be able to penetrate through the wall. And yet, the propagated UWB signal is significantly affected by the frequency-dependent properties of the wall itself, which, depending on its material composition, is polarized differently according the interacting electromagnetic field. As explained in one contemporary scientific textbook on through-the-wall radar imaging:

> Over such a wide range of frequencies, materials exhibit diverse behaviors when interacting with electromagnetic waves. As the frequency of the interacting field increases, the molecular dipoles of the material subjected to the field cannot respond instantaneously. *The result of this sluggish response of the material to the electromagnetic waves is dispersion*. This phenomenon causes different spectral components of the UWB signal to travel at different speeds.[41]

As UWB signals are dispersed by the frequency-dependent properties of the wall, TWS begin to exhibit a range of effects, including pulse broadening, reduction in signal amplitude, signal distortion, and loss of bandwidth accuracy. Ultimately such effects produce image distortions in the TWS device, thus reducing the ability to identify targets beyond the wall.

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In contrast, a PW device emits a quick, discrete signal of a single frequency. Because the initial speed of the pulse signal is known in advance, the device can compute the relative distance of a target based on how long it takes for that signal to return to the receiver. The Range-R is an example of a PW device that uses a Stepped Frequency Continuous Wave (SFCW). In this case, the device sweeps across a range of frequencies in discrete steps. The change in frequency creates a synthetic pulse that allows the device to determine the distance of a target by examining how much time it took the pulse to travel from the transmitter to the object and back to the receiver. By using a wide range of frequencies, SFCW devices are able to increase the likelihood that the signal will adequately penetrate the wall without too much signal loss. Ultimately, the Range-R displays a single numerical value that indicates the relative distance of the target from the device, as well as whether the detection is based on the target moving or breathing.

[41] Muqaibel, Alsunaidi, Iya, and Safaai-Jazi, "Wall Attenuation and Dispersion," 10; emphasis added.

In the early 2010s, ManTech Advanced Systems International conducted a series of tests and market surveys of various handheld TWS, including the Xaver 100 and 400, for the National Institute of Justice to determine their efficacy for law enforcement.[42] The primary goal for the ManTech study was to determine the level of accuracy of the TWS devices within a range of contexts (e.g. garage, house, and office), with walls of different materials (e.g. cinder, glass, vinyl, and brick), and with targets in various positions (e.g. walking, sitting, laying down). Ultimately, the report concluded that the devices "were able to detect and locate targets behind most barriers with at least a reasonable level of probability and accuracy [and that] moving targets were more easily detected than still targets."[43]

Nevertheless, ManTech took note of three key limitations due to the dispersive qualities of TWS signals. First, various types of construction materials effect waves differently. For example, lower frequency waves tend to be more prominently attenuated by concrete but pass easily through plywood and pine board, while higher frequencies tend to be effected by materials of all kind. TWS are not able to penetrate walls made with metal or aluminum or walls with metal-based insulation. Second, some TWS, like the Xaver 400, exhibit a pronounced time lag between the actual location of the target and the location indicated on the display due to signal processing and the operation of internal algorithms to interpret targets.[44] Third, and most

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[42] Chad Huffman, Jon Hayes, and Lars Ericson, "Through-the-Wall Sensors (TTWS) for Law Enforcement: Test & Evaluation (Version 1.2)," National Institute of Justice and ManTech Advanced Systems International, March 18, 2014, https://www.ojp.gov/pdffiles1/nij/grants/245944.pdf. Huffman, Chad, Jon Hayes, and Lars Ericson, "Through-the-Wall Sensors for Law Enforcement: Markey Survey," National Institute of Justice and ManTech Advanced Systems International, October 2012, https://www.hsdl.org/?view&did=752997.

[43] Huffman, Hayes, and Ericson, "Through-the-Wall Sensors (TTWS) for Law Enforcement," 107. In particular, the Xaver 400 demonstrated the highest overall performance for those devices tested directly against the wall (as opposed to a stand-off position) with an averaged 93% detection rate for all three modes. The Xaver 100 showed less success in trials (62%), but was significantly better at detecting targets in Expert Mode (85%) compared to Normal Mode (53%) and detecting targets that were moving (91%) versus still (44%). By comparison, the Range-R showed a 74% detection rate for at-the-wall trials while the ASTIR showed a 68% percent detection rate for stand-off trials.

[44] Relatedly, in a separate NIJ-funded study by AKELA, researchers found that reflected signals of different frequencies passed through the ASTIR system's components (amplifiers, filters, cables, and antennas) at variable

importantly, the study reported additional issues with target detection caused by the dispersion of electromagnetic radiation caused by the wall and the physical characteristics of the multipath interior environment. They found that when a signal is dispersed to a significant degree, the reflected signal returns to the device at different times via different propagation paths and with different characteristics. These additive signal components can in turn cause a target's spectral energy to be concentrated in a location that does not correspond to its true location. In the electrical engineering community, such false targets are called "ghosts," which can sometimes appear more pronounced than actual targets in the visual display.[45]

The researchers in the ManTech study observed how the dispersion of UWB signals often made it difficult to discern between targets and non-targets depending on the mode in each Xaver device.[46] In those modes that employ internal algorithms to identify targets, the dispersion of radar signals occasionally yielded false positive identifications. The Xaver 100 Normal mode, for example, was found to have the largest percent distance uncertainty of all tested devices. Since only the object with the strongest reflection is identified to be the human target on the graphic

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speeds. In response, the researchers introduced a group delay algorithm that corrects for frequency dependent signal delay variation by adjusting the signal's frequency components to a known fixed point. AKELA, "Through the Wall Standoff Detection and Tracking of Individuals," National Institute of Justice, April 30, 2012, https://www.ojp.gov/pdffiles1/nij/grants/240231.pdf, 21.

[45] Traian Dogaru and Calvin Le, "SAR Images of Rooms and Buildings Based on FDTD Computer Models," *IEEE Transactions on Geoscience and Remote Sensing* 47.5 (2009): 1388-1401.

[46] In the NIJ-funded study by AKELA, researchers observed a similar issue with ghosts in the ASTIR system, particularly with respect to its use of multiple antennas to detect reflected signals. In order to form a radar image of a particular object, ASTIR sums together the information sensed by each antenna at the location where their elliptical range profiles intersect. However, the elliptical bands of each antennas in fact intersect at two locations: one at the location of the real target and the other directly equidistant to the device on the opposite side. This second intersecting point creates a "mirror target" which can cause targets behind the device to appear as if they are in front of it. In most scenarios of radar imaging, this mirror target can be ignored since antennas are designed to have high directionality, which means that they direct the vast majority of their signal forward. However, as the researchers observe, mirror targets can pose a significant issue in TWS systems specifically due to the dispersion caused by the wall itself in relation to the actual and mirror target: "signals from a target in front of the system, inside a building, have to travel through the building walls, which may attenuate the signals significantly. This can result in a target in front of the system actually having similar signal strength to one behind the system." In some cases where the target behind the system is larger than that in front of it or closer to the device, the mirror target may appear larger than the actual target or even show up in radar images inside the building. AKELA, "Through the Wall Standoff Detection and Tracking of Individuals," 17-18.

interface, the device has difficulty stabilizing a target source, regularly fluctuating between distances.[47] In the Xaver 400 Tracker mode, various reflected signals sometimes caused the device to identify multiple targets when only one was present or misidentify the intended target in a different location. In modes that display unfiltered information about the reflected signal, potential false positive identifications were left to the operator's judgment. For example, in the Xaver 400 Expert mode, targets are considered to be true depending on their signal strength, the rhythmic pulsation of the signal, and the movement of the signal over time, while ghosts are attributed to signals that are weak or intermittent.[48] Due to the myriad possibilities for false-positive identification, the NIJ ultimately warns that TWS "should not be used as the only contributing factor for entry or justification for a cause of action."[49]

On the one hand, ghost targets might suggest a deficiency in the design and implementation of TWS like Xaver devices. However, insofar as signal effects like dispersion are necessary parts of TWS, I argue that they instead reveal how the ability for TWS to see through walls is both complicated and yet made possible by the microphysical properties of electromagnetic dispersion. To be sure, without a direct line-of-sight into a target environment, no TWS can perfectly reveal what is hidden from view. In order for the radar technology to produce images of a hidden space, its propagated signal will inevitably be transformed by the frequency-dependent properties of the wall itself (and then subsequently transformed by objects within the interior multipath environment). As the reflected signal becomes distorted in the process, TWS in turn must deploy various kinds of signal and image processing algorithms to

[47] Huffman, Hayes, and Ericson, "Through-the-Wall Sensors (TTWS) for Law Enforcement," 37.
[48] Huffman, Hayes, and Ericson, "Through-the-Wall Sensors (TTWS) for Law Enforcement," 25-26.
[49] Jon Hayes and Lars Ericson, "Through-the-Wall Sensors for Law Enforcement: Best Practices," National Institute of Justice and ManTech Advanced Systems International, March 2014, 9. As the guide continues to note, "most states require a warrant before using a TTWS device on a building, unless there is an active situation where there is no expectation of privacy, such as a known hostage or standoff situation" (10).

model the received signal, remove clutter, and extend the range of detection. While such algorithmic processes risk producing false-positives, at the same time the inability for TWS to consolidate reflected signals into stable targets is not always an impediment. As the authors of the ManTech study observe, in those modes in Xaver devices that use internal algorithms to automatically label targets, operators typically consider the device to have positively identified a target if the target remains fixed for more than two seconds.[50] And in those modes that present unfiltered information about reflected signals, the ability for the device to isolate human targets from stationary objects is contingent on the operator's personal judgment.[51]

Ultimately, this suggests that dispersion is not simply a technical issue that impacts the ability for TWS to propagate and sense radar signals through walls. Rather, dispersion registers how TWS detect targets through a series of mediations that scale across the microphysical properties of electromagnetic signals, the built environment, and the operator. While dispersion causes problems like signal distortion and pulse broadening, it is precisely through these elements of signal phenomenology that such devices render legible what is previously obscured, whether that is an object like a human body or the layout of building. In turn, if a TWS can parse a target from its surrounding environment, this is only because it is able to transform reflected waves into a sign that is then interpreted as an index of that object's presence by the device's operator. Whatever degree of transparency is afforded by TWS is thus grounded in the very limitations of signal processing when electromagnetic waveforms become dispersed by the built environment. Ultimately, then, targets are not stable objects in space that pre-exist the deployment of TWS. Rather, they are constructed and given visual form through the

[50] Huffman, Hayes, and Ericson, "Through-the-Wall Sensors (TTWS) for Law Enforcement," 33.
[51] Huffman, Hayes, and Ericson, "Through-the-Wall Sensors (TTWS) for Law Enforcement," 110.

microphysical properties of dispersion itself at the intersection between machinic and human forms of sensemaking.

*Targeting Matter*

By framing target detection as a series of mediations of electromagnetic processing and interpretation, we can better witness how US imperial power is intensive in the complex materialism of radiation, especially when TWS are deployed in sites of militarized conflict. Key here is how the violence of military technologies is not simply limited to their ability to represent or convey threat for the exercise of lethal force upon bodies, environments, or infrastructure. As Matthew Fuller and Andrew Goffey suggest, military technology increasingly operate through a non-representational aesthetics of mediation, which underscores "the military capacity to develop new capacities for *becoming in* media systems." [52] The exercise of militarized violence inheres within "the material effectiveness of media, without constraint to merely semiotic registers or the interminable compulsion to communicate."[53] For example, sonic weapons, like the Long Rage Acoustic Device (LRAD) used by the US military in Iraq, emit highly focused high pitched acoustic signals towards their target in order to inflict pain and deter enemy advancement. The sound is less important for its representational qualities than for its material effectiveness upon the body within sites of armed conflict. In like manner, I argue that as TWS are used to detect targets and visualize space, militarized violence is remediated through the very propagation, processing, and interpretation of electromagnetic radiation, especially when matter itself is transformed through differences in signal phenomenology.

[52] Matthew Fuller and Andrew Goffey, "Toward an Evil Media Studies," in *The Spam Book: On Viruses, Porn, and Other Anomalies from the Dark Side of Digital Culture*, ed. Jussi Parikka and Tony Sampson, 158 (New York; Hampton Press, 2014); emphasis added.
[53] Fuller and Goffey, "Toward an Evil Media Studies," 158.

Key to the way that militarized violence inheres within the microphysical properties of signal dispersion is how TWS detect targets by transforming the sensorial capacities of matter into measurable differences of electromagnetic radiation. Unlike other recording media like photography where information is inscribed into a material substrate, in radar technology information is discerned as the difference of the waveform's physical properties between its propagation and reflection. Referring to this as the "radiographic episteme," Jeremy Packer explains, that for radar technologies "all that can be known" is contingent upon "the reflective conditions and characteristics of radio waves and environment."[54] In this case, the presence of an object in a radar image merely indicates that there exists something in space that is reflective of electromagnetic waves and is therefore distinct from the medium (i.e. the air) through which such waves propagate unhindered. Within the radiographic episteme, then, detectability is contingent upon the ability to sense the time delay of the reflected signal (usually on the order of a few picoseconds) as well as other variables that might be affected within the course of signal propagation like frequency and amplitude.

The radiographic episteme describes how all forms of military radar technology detect objects within a given environment for conquest and control. Such is the case for satellite imagery that can be used to target human life in specific territories. Lisa Parks explores how the radiographic episteme underpins how geospatial images reassert US vertical hegemony in the War on Terror, in turn producing a "microphysics of geospatial imagery—the sociotechnical and power-laden processes by which electromagnetic radiation traveling through the atmosphere is detected and turned into imagery."[55] As she explains, a geospatial image is constructed from data

[54] Jeremy Packer, "Screens in the sky: SAGE, surveillance, and the automation of perceptual, mnemonic, and epistemological labor," *Social Semiotics* 23.2 (2013): 189.
[55] Parks, *Rethinking Media Coverage*, 105.

gathered by multiple satellites that move across a spatial region. By computing the difference between the propagated and reflected signal, one can then calibrate that data using geolocation software into a pixelated grid that visualizes the landscape. In addition, each pixel contains multiple sources of information about reflected electromagnetic frequencies (like infrared radiation) which can be activated depending on what kind of information one wants to visualize in the image. The geospatial image is thus not a direct view onto the world, but a highly complex "techno-social formation" composed by both electronic sensors and human laborers which determine what takes on significance in the final visualization and what can be overlooked.[56] Importantly, because the satellite moves in relation to the landscape and thus senses the reflected signal at two different locations, the resulting image visualizes all kinds of stationary objects on the ground, including humans as well as non-human matter like plants, animals, and rocks. And yet, as Parks observes, very often the geospatial image is constructed specifically to detect human life as a potential terrorist threat while relegating all other non-human matter as insignificant background. Ultimately, such an optic involves a process of seeing like the state in which the detection of human activity "negates the agential capacities of multiple kinds of materials and objects in the visual field" in ways that are consistent with terrestrial legacies of imperialism, conquest, and control.[57]

Much like satellite geospatial imagery, TWS interpret the time difference between propagated and reflected electromagnetic radiation in order to detect targets against the background of a given environment. In this sense, like Parks, I argue that TWS operate as part of the microphysics of power of US vertical hegemony "by mediating sites and objects of interest" in order to visualize human matter as terrorist threats. However, unlike satellites, TWS must

[56] Parks, *Rethinking Media Coverage*, 118.
[57] Parks, *Rethinking Media Coverage*, 119.

account for signal propagation effects like dispersion *before* the signal interacts with the intended reflective medium. Through dispersion, a UWB signal bends and spreads out in space such that its reflected component frequencies ultimately arrive back to the device at different times. For the most part, this doesn't cause much of an issue since of most the target environment is stationary and thus is interpreted as a background. But things get more complicated with moving targets. Indeed, TWS will interpret as a target anything that causes the dispersed UWB component frequencies to continually return to the receiver a different times. This means that they are often unable to discern between different kinds of objects based on their relative movement, including human and nonhuman entities. As stated in a 2014 Best Practices Guide published by the NIJ, "TTWS devices will detect all motion, including trees and animals such as household pets […] Even motion from inanimate sources, like fans and moving curtains, can trigger TTWS device detection."[58] Additionally, devices may not be able to register some objects depending on their relative movement; a person standing immediately against the opposite of the wall may be interpreted as the wall itself while people moving behind metal objects like refrigerators cannot be detected. A 2019 report from the DHS further observes that most TWS (including the Xaver 100) "cannot distinguish between stationary and deceased people" despite their alleged ability to detect minute movements from breathing. Moreover, electronic interference from wireless networks GPS receivers, and cellphones might also cause TWS to detect motion, while certain kinds of structural components like adjacent walls and mirrors can cause multiple reflections.[59] Taken together, the NIJ ultimately warns that operators must "always be aware of the whole environment."[60]

[58] Hayes and Ericson, "Through-the-Wall Sensors for Law Enforcement: Best Practices," 10.
[59] Huffman, Hayes, and Ericson, "Through-the-Wall Sensors (TTWS) for Law Enforcement," 110-111; 8.
[60] Hayes and Ericson, "Through-the-Wall Sensors for Law Enforcement: Best Practices," 7.

An initial study from Camero on the Xaver 800 reveals how the microphysical qualities of dispersion cause TWS to confuse movements from human and non-human targets. In a 2006 report introducing the UWB technology in the Xaver 800, Camero researchers explain that by using wider frequency bandwidth, they can compensate for signal dispersion caused by the wall as well as increase the resolution of the final image. However, a higher bandwidth results in more opportunities for time delays in the reflected signal because its component frequencies are dispersed differently depending on the frequency-dependent properties of the built environment. Ultimately, by integrating novel signal and image processing algorithms, the Xaver 800 can supposedly align the time difference within the dispersed signal in order to reveal "objects situated behind walls with sufficient resolution such that a person can be observed including his different body parts."[61] In a preliminary experiment from that study, researchers use the Xaver 800 to detect a man and a dog beyond a barrier. While relatively successful in compensating for signal propagation effects to locate the position of the two bodies, the device nonetheless cannot distinguish between human and non-human targets. Instead, both the human and the dog are represented as floating blobs in the three-dimensional grid. The resulting display thus provides little information about where one body ends and the other begins, let alone specific information about what kinds of matter are being detected. In fact, the researchers acknowledge as such, suggesting that ultimately the decision of what counts as a target rests on the operator's "ability to understand that there are two separated objects, one tall and looks like a person, the other one is short and looks like a dog, as well as to understand intuitively the position and the meaning of the scenario."[62]

[61] Amir Beeri and Ron Daisy, "High-Resolution Through-Wall Imaging," Proceedings of SPIE vol. 6201 (2006), 1.
[62] Beeri and Daisy, "High-Resolution Through-Wall Imaging," 5.

To be sure, the computational capacities of the Xaver 800 are likely more sophisticated in the actual device than in the original 2006 study which was intended to assess the capacities of the new UWB signal and image processing algorithms. And yet, a commercial on the company's website reveals that the interface still represents moving targets as different colored "blobs" in a three-dimensional gridded display (fig. 3.3). Curiously, however, the commercial claims that the device is able to detect multiple "moving or non-moving living objects," while static objects can be represented in a top-down view as lighter colors dots to help the operator determine the layout of the room. Camero here ignores the fact that moving non-living objects (like fans) or moving non-human targets (like dogs) can appear as targets and that non-moving living objects (like an unconscious human) might actually appear as static background matter. Such issues are allegedly addressed in a more recent device announced by Camero in 2022, the Xaver 1000, which purportedly uses artificial intelligence to track targets and is able to discern the body parts human and animal subject along with visual markers of body parts. However, in the absence of any substantial demonstration or study of this device, such technical capacities are still yet to be confirmed at the time of this writing. The only public-facing material from Camero about the device is a commercial which recycles the same graphics and visuals as the Xaver 800.

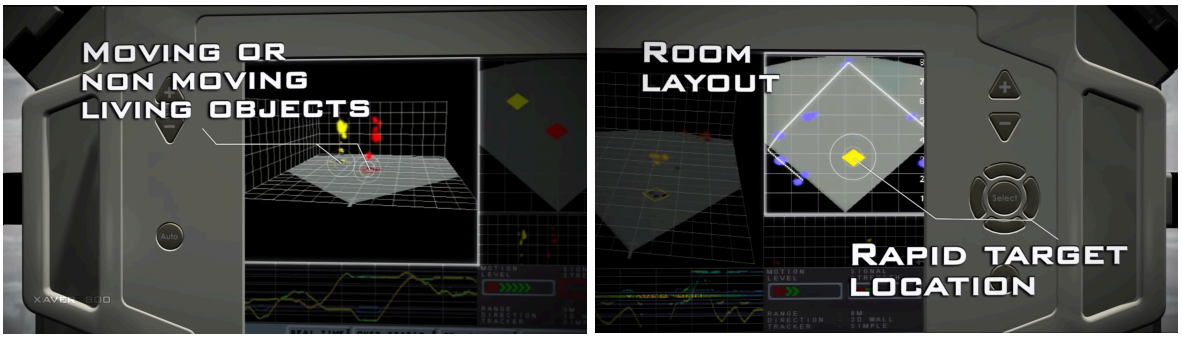


Fig. 3.3: Stills from a commercial for the Xaver 800 produced by Camero. The device identifies "living objects" regardless of their relative movement in relation to the wall (left). The device can also detect non-moving, non-living objects (the light blue blobs along the white line), which can assist the observer in determining the layout of the room (right). Screenshots by author.

As the technical reports and studies from the NIJ and Camero demonstrate, TWS like the Xaver series detect relative movement within a given environment regardless of the object itself, thus reproducing matter as abstracted blobs in the visual display. There is ultimately no difference between the human and nonhuman—even if operator is supposed to intuitively comprehend all targets as human and all non-targets as non-human. I argue that it is here—in the potential for mediating all matter as threat—that TWS consolidate imperial power within the microphysics of radar technology. Just like the shutter of the camera—which Ariella Azoulay describes as a "materialization of an imperial technology" that strips the world of its singularity—TWS image and signal processing algorithms arrest the variegated flux of dispersed electromagnetic radiation into a secure target on a digital interface.[63] In the process, TWS forcefully disarrange matter itself, bringing forth novel proximal relations among objects within the complex materialism of electromagnetic radiation. Through signal dispersion, TWS simultaneously blur the boundaries of human and non-human matter at the same time that they purportedly stabilize those boundaries as into visual icons like blobs that operators must interpret as targets. In turn, any source of reflected radiation can be interpreted a target: a fan could be mistaken for a terrorist or a dog for a hostage. Within this fantasy of ubiquitous surveillance, all matter is threatening.

[63] Ariella Aïsha Azoulay, *Potential History: Unlearning Imperialism* (New York: Verso, 2019), 7. The camera shutter, writes Azoulay, "is a synecdoche for the operation of the imperial enterprise altogether, on which the invention of photography, as well as other technological media, was modeled" (2). In the brief instant of opening and closing, the shutter strips the world of its singularity, reproducing that world as an object to be owned (read: as property) within the image-form of neutrality and evidence. As Azoulay writes, the shutter "can transform an individual rooted in her life-world into a refugee, a looted object into a work of art, a whole shared world into a thing of the past, and the past itself into a separate time zone, a tense that lies apart from both present and future" (6). Translated into a technique of empire, the imperial shutter thus is ultimately characterized by a "regime of coordinated thresholds" (167) that differentially distribute rights, resources, and sovereignty. In the opening and closing of the imperial shutter, life-worlds are created and destroyed.

Dispersion thus is a productive mechanism for imperial power insofar as it enables TWS to construct targets from reflected electromagnetic radiation. In this sense, dispersion consolidates the matrices of what Brian Massumi calls "ontopower" that underpin the operational logic of preemption. As a positive and emergent force "through which being becomes," ontopower is that which produces the forms of life that a particular being will assume as a subject of preemptive governance.[64] Preemption does not locate in advance the object of threat-potential, but instead makes any and all forms of exceptional difference (embodied, territorial, political, and temporal) open to risk assessment in order to legitimize the expansion of US imperial violence. Such is the case, for example, in drone warfare wherein preemption produces space itself as a site of terrorist activity, productively misrecognizing the perceived sovereignty of national geopolitical boundaries in order to construct new landscapes of insurgency within which all bodies become laden with potential violence.[65] Similarly, TWS treat the microphysical characteristics of electromagnetic radiation (including frequency, velocity, and intensity) as the exceptional difference through which targets are constructed as active sites of knowledge production. However, what makes TWS unique here from other militarized radar technologies like drones and satellites—and what sets them apart from received frameworks of ubiquity that dominate discussions of war media—is how they consolidate preemptive logics *within* their internal mechanisms. Through various signal and image processing algorithms, TWS interpret dispersed electromagnetic radiation in order reconstruct the relative movement of matter in a given scene. Put in a slightly different register, TWS use various internal mechanisms to animate

[64] Massumi, *Ontopower*,71.
[65] As Keith Feldman explains, the "future anterior grammar of pre-emption provides the temporal frame for the raciality of the war on terror, whose substantial differentiation from earlier forms of colonial warfare — where accumulation by dispossession was accomplished through extraterritorial conquest and settlement from without — brings to bear geographic ambiguities made sensible only through preventing what 'will have been.'" Keith Feldman, "Empire's Verticality: The Af/Pak Frontier, Visual Culture, and Racialization from Above," *Comparative American Studies: An International Journal* 9.4 (2011): 331.

the world within an image of militarized violence. Rather than sense discrete objects in space, they make matter reveal itself as targets within a defined scene of intervention. TWS thus are not simply perception devices that allow operators to see inside buildings, but also affective devices that move things (sensations, bodies, matter) in and out of circulation, violently reconfiguring private domestic interiors to produce the threat that they are deployed to visualize. To be sure, insofar as they preclude the inability to reliably discriminate among various kinds of matter, TWS could be useful for soldiers or police who are looking for justification to search a building.

Ultimately, by turning our attention to the technical and aesthetics qualities of dispersion, I argue that we discover another reading of how ubiquity is produced as a medial effect in TWS. While radar technology like satellites exploit the ubiquitous spread of electromagnetic radiation to sense objects and deliver information, TWS are able to transform all matter into targets by using signal and image processing algorithms to compensate for the dispersal of radiation. In this version of ubiquity, if any matter can be identified as a target, then potentially anyone can be subject to the racializing optics of state surveillance. And yet, as Camero acknowledges, even as all matter can be visualized as targets by devices like the Xaver 800, operators must nonetheless intuitively interpret the scene based on preconceived knowledge frameworks of threat, especially when used in sites of imperial and colonial violence like Iraq, Afghanistan, and Palestine. In this case, we must consider how TWS are deployed as technologies of counterinsurgency wherein interpretation is very often animated by the affective contours that course through Western security paradigms. In the next section, I thus shift attention to public displays and commercials of the Xaver series in order to demonstrate how the medial effect of ubiquity is negotiated within the visual rhetoric of US imperial culture. What becomes apparent in these cases is how social difference enters into TWS as a technics that not only troubles how these devices are imagined to

operate outside of human bias, but also reveals how targets are constructed as racialized entities within various scenes of counterterrorism.

*Marketing Counterinsurgency*

In a presentation at the 2014 American Israel Public Affairs Committee (AIPAC) Innovation Showcase held in Washington D.C., CEO of Camero Amir Beeri demonstrated the Xaver 800 to an audience of 14,000 attendees.[66] The goal was to showcase Xaver devices as powerful reconnaissance technologies for increasing situational awareness. Joined by an American police lieutenant who uses the device in the line of duty, Beeri explains that the Xaver series allows military, police, and first responders to "see into building with no line of sight," which can aid in increased intelligence and ultimately more efficient means to "save lives." On stage at the AIPAC demonstration is a brick wall (fig. 3.4). On the left side, Beeri, the lieutenant, and the moderator circle around the Xaver 800. On the right side, two aides simulate a potential tactical situation, one huddled on the floor and the other pacing back and forth a few feet behind. After Beeri describes the graphical layout of the interface, the moderator asks the lieutenant to interpret the display as if it were a real life situation. Taking note of the relative movement of the subjects over time, the lieutenant labels the pacing target as the "bad guy" and the stationary subject as a "hostage." And yet, as projected for the audience to see, the device only displays an array of colored blobs floating in three-dimensional space. At work here are at least three levels of (mis)interpretation: first, that the moving targets are human; second, that the pacing subject is a man; and third, that there is a relationship among the targets characterized by a power dynamic (a hostage situation).

[66] The full video of the presentation is archived on Camero's YouTube page. Camero-Tech, "Camero at AIPAC 2014 Innovation Showcase," YouTube, March 10, 2014, https://www.youtube.com/watch?v=zLjPcWYcDnY.

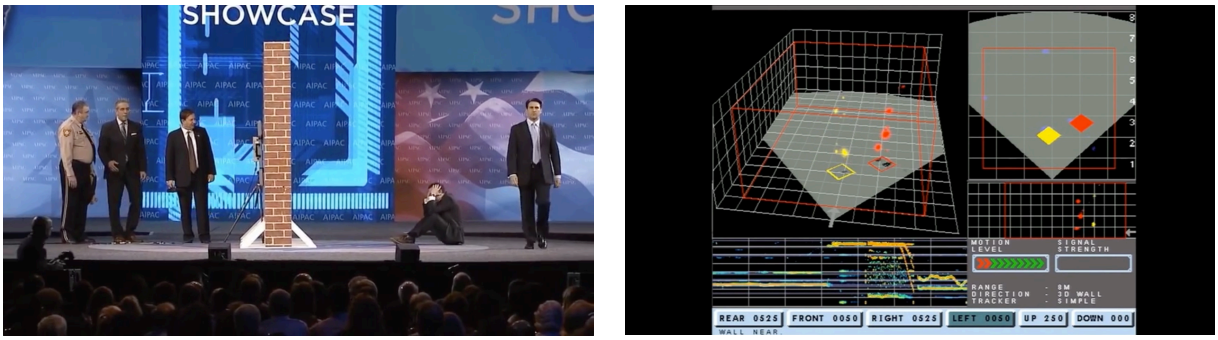

Fig. 3.4: Two still from video documentation of Camero's demonstration of the Xaver 800 at the 2014 American Israel Public Affairs Committee (AIPAC) Innovation Showcase held in Washington D.C. Two aides simulate a hostage situation as Beeri explains to the audience how the Xaver 800 operates (left). The visual display of the Xaver 800 is projected on a larger screen for the audience (right). Screenshots by author.

The message of the demonstration is clear: the Xaver 800 is a valuable technology for preempting threat insofar as it can help foresee a potentially dangerous scenario and provide operators intelligence on how to intervene. As reflected by Camero's motto, the Xaver series lets one "step into the known." However, what is notable about the presentation is how the hostage simulation and the Xaver display remove the differences in racialized and gendered embodiment that typically mark the "bad guy" as the locus of violence in US imperial space.[67] In the War on Terror, preemption emerged as a racializing technology of counterinsurgency that locates the racialized Other laden with terrorist threat. In many cases, preemptive logics aim to forestall the emergence of threat by affixing it to the spatiotemporality of Muslim bodies which, as Junaid Rana argues, are considered within the American imaginary as internally imbued with ideologies of violence and terror.[68] Complicit here too is the history of antiblack US surveillance in the

[67] As postcolonial scholars of American empire in the twentieth and twenty-first century have shown, racialization is central analytic within the calculus of US imperial warfare. To be sure, the goal of American global empire has long been to "universalize white supremacy and to establish the United States as its hegemon" by constructing a binary between civilized and uncivilized nations, the latter of which is home to the racialized Other that must be subdued, conquered, or eliminated. Anthony Monteiro, "Race and Empire: W.E.B. Du Bois and the US State," *The Black Scholar* 37.2 (2007): 38. See also Nikhil Singh, "The Afterlife of Fascism," *South Atlantic Quarterly*, 105.1 (2006): 71–93; Jasbir Puar, *Terrorist Assemblages: Homonationalism in Queer Times* (Durham: Duke University Press, 2007); Gretchen Murphy, *Shadowing the White Man's Burden: US Imperialism and the Problem of the Color Line* (New York: New York University Press, 2010); Lisa Lowe, *The Intimacies of Four Continents* (Durham: Duke University Press, 2015).

[68] Junaid Rana, *Terrifying Muslims: Race and Labor in the South Asian Diaspora* (Durham: Duke University Press, 2011). Importantly, however, preemptive logics do not always define in advance what forms of embodied difference

post-Civil Rights era—such as the FBI's COINTELPRO program from 1956 to 1971 (see the introduction)—which targeted Black activists as an internal domestic threat. Such histories of domestic counterterrorism in tandem with global US imperial projects against anticolonial leftist movement in the 1960s and 1970s reveal how Blackness provided the rhetorical link between the national criminal and the foreign Muslim terrorist in the decades preceding the attacks on 9/11.[69]

And yet, the absence of forms of racialized and gendered exclusion in the presentation is strategic. By divorcing the staged hostage simulation from the context of racialized counterinsurgency in the US-led occupation of the Middle East and in militarized policing practices in the homeland, the presentation gives lie to the notion that TWS operate prior to and outside of human bias or discrimination. In this sense, Camero positions TWS within a broader ideology of what Jeremy Packer and Joshua Reeves understand as a techno-fetishistic "anthropophobia" that permeates the design and implementation of war media.[70] Emerging from the technical idealism of Enlightenment thought and the political and moral philosophy of liberalism, the American dream of a "perfectly efficient war machine" relinquishes human perception and embodied difference from the mechanical operation of various weapons systems, including UAVs, anti-ship missiles, and other AI weapons apparatuses.[71] While Xaver devices are not fully automated, instead relying upon human interpretation to identify potential targets of threat, the presentation nonetheless suggests that TWS need not be burdened by problems of

might be racialized as the terrorist threat, but instead ambiguates sociopolitical relations in order to justify the exercise of extrajudicial force. As Ronak Kapadia argues, within the War on Terror, American imperial power did not locate terror upon a singular "Muslim" body, but rather constructed "a visible, external 'Muslim' enemy by conflating transnational differences of region, nationality, ethnicity, class, gender, and religious affiliation." Kapadia, *Insurgent Aesthetics*, 55-56.

[69] See Sohail Daulatzai, *Black Star, Crescent Moon: The Muslim International and Black Freedom beyond America* (Minneapolis: University of Minnesota Press, 2012); Erica Edwards, *The Other Side of Terror: Black Women and the Culture of US Empire* (New York: NYU Press, 2021).

[70] Packer and Reeves, *Killer Apps*, 17.

[71] Packer and Reeves, *Killer Apps*, 16.

human bias or power differentials in sites of militarized conflict; the Xaver 800 can ostensibly track and visualize scenes of threat without any degree of ambiguity.

Here we begin to see how the technical and aesthetic dimensions of dispersion facilitate the emergence of TWS as unbiased mediators of preemptive risk-assessment rather than key technologies for racialized violence. Through dispersion, Xaver devices abstract bodily difference into moving blobs on the user interface that removes identifying information about targets (human or otherwise) such that it becomes impossible to discriminate based on racial and gendered embodiment. In this way, the misrecognition of TWS as an apolitical technology gestures more broadly to the way that electromagnetism is framed as a neutral ubiquitous medium in other kinds of visual surveillance practices due to the way it abstracts markers of human differentiation. In thermal imaging, for example, all bodies appear as gradations of temperature against a darkened background. These visual rhetorics ultimately make electromagnetic surveillance technologies appear benign, no longer motivated by political concerns and thus capable of being integrated in all aspects of social life. However, even as thermal sensors seem to remove social difference as a variable for threat detection, such images are nonetheless generated and made operational within existing regimes of power. As Parks explains:

> Strategies of ethnic/racial differentiation do not disappear within an aerial system of temperature-based visuality; rather, they are restructured along a vertical axis of power and recodified according to issues such as moving to or being in certain places at certain times, being in the vicinity of other suspects, driving certain vehicles, or carrying certain objects with certain temperatures or shapes or sizes.[72]

While bodies detected by thermal surveillance might not be visually recognizable based on surface appearance, they are nonetheless already identified as targets of threat within the

[72] Parks, *Rethinking Media Coverage*, 169.

preemptive security logics of counterinsurgency. These digital apparitions, or "spectral suspects," become racialized within an imperial gaze that predetermines which territories are inhabited by enemies, which patterns of movement are risky, and what threshold of thermal intensity merits further investigation.[73] In like manner, surveillance practices involving TWS draw upon the racial calculus of preemption in order to construct targets as objects of threat. As made apparent in the AIPAC demonstration, despite how TWS abstract forms of embodied difference in their visual display, operators nonetheless assign threat to specific targets by interpreting certain patterns of electromagnetic radiation within received narratives of counterterrorism.

Here then we encounter a gap between how TWS construct targets through the microphysics of electromagnetic radiation and how operators use TWS in scenarios in which the enemy is presumed to be known in advance. I argue that it is in this precise gap between human and machinic forms of sensemaking where social difference structures how TWS consolidate imperial power through techniques of mediation. In what follows, I turn to a commercial produced by Camero of the Xaver 800 that shows how the technics of social difference underpin how the device is used in counterinsurgency operations. As I demonstrate, the commercial misrepresents the technical capabilities of TWS by effacing how dispersion underpins the ability for Xaver devices to sense targets beyond walls. However, in doing so, the commercial reveals how TWS draw upon formations of racialized and gendered alterity in order to render legible electromagnetic radiation as targets for intervention. In order to achieve the promise of ubiquitous surveillance, social difference is marshalled to fill the gap between human frameworks of threat and machinic processes of target detection. Thus, while such

[73] Parks, *Rethinking Media Coverage*, 169.

representations don't accurately portray the operation of contemporary TWS like Xaver devices, they nonetheless reveal the speculative ideals of ubiquity that underpin their circulation within global defense industries.

In a commercial published on its YouTube account, Camero demonstrates how the Xaver 800 may be deployed to, as the voiceover states, "empower forces in the most critical, rapidly evolving scenarios." At the core of the commercial is a fictional hostage scenario, much like the AIPAC demonstration. Following instruction from an counterterrorism command center, a troop of soldiers is dispatched to a remote area to recover a hostage from a non-descript warehouse. At first, the troop attempts to peer inside the building with a rifle scope. Unable to get a clear visual, they then deploy the Xaver 800 to locate their targets inside the building. Upon being activated, the device begins to emit digitally rendered rings of concentric circles as if to replicate the propagation of electromagnetic waves (fig. 3.5). Crucially, as the waves interface with the building, they pass though unhindered by the frequency dependent properties of the wall's material composition, thus ignoring how signal propagation effects like dispersion underpin data-based processes of target detection. Once the rings permeate the warehouse, we are given our first glance inside. Much like the AIPAC demonstration, we discover a hostage scenario in which the "bad guys" don't conform to the usual tropes of the Muslim terrorist in post-9/11 US security culture. In this case, a dark-skinned man is held captive by two white men, one with long shaggy hair smoking a cigarette. To be sure, such casting choices are consistent with Camero's marketing strategy to mask the political biases that underpin the deployment of Xaver devices in imperial sites of war-making.

Fig. 3.5: In the commercial for the Xaver 800, CGI effects are used to represent that propagation of electromagnetic radiation (left). As the waves reach the building, they pass through unhindered, thus enabling the device to peer inside the building (right). Screenshots by author.

What's most significant about the commercial is how it consolidates the technical operation of TWS around the problem of terrorist embodiment. On a formal level, it draws upon familiar visual tropes of counterinsurgency in post-9/11 US security culture. Much like procedural counter-terrorism dramas like *24*, *Homeland*, *Sleeper Cell* and *Person of Interest*, the commercial stylizes the hostage scenario through the use of muted monochromatic color (blues and grays), fast cross-cutting between scenes, and graphic overlays of geolocation markers, visual icons, and code (as if one is looking through military goggles with a heads-up display). More conceptually, however, the commercial reveals how, as Rachel Hall argues, the US military and US media corporations configure "terrorist embodiment as a problem of opacity."[74] We see this most vividly in the use of CGI to visualize the hidden interior. After the troops reposition closer to the warehouse and install the Xaver 800 against the wall, the commercial employs digital effects to transform the building into a gridded environment within which we

[74] Rachel Hall, *The Transparent Traveler: The Performance and Culture of Airport Security* (Durham: Duke University Press, 2015), 59. For Hall, the opacity of terrorist embodiment is articulated within techniques of media representations, particularly in the difference between photographic and digital media. As she explains, "across a range of media depictions of ordinary and iconic enemies in the War on Terror, photography connotes opacity and promotes immobility as the proper treatment of the diabolically opaque, whereas CGI connotes transparency and enables the mobility of the visual subject of the war" (58). For example, in the pursuit and seizure of Saddam Hussein, US media mobilized photography to show the intractability of the terrorist body and its hideout within the dominant visual field, while digital media was employed to reconstruct Hussein's capture, thus providing audiences a forms of virtual tourism that illuminates that which was previously concealed.

find the located targets, represented as floating three-dimensional blobs (fig. 3.6). A quick shift in camera perspective then fills the screen with the gridded environment as if to replicate the audience's own view of the device's display. Crucially, as the wall itself disappears, the commercial gives the impression that TWS operate similarly to satellites or drones in free-space environments where dispersion is not an expected property of signal propagation. At the same time, it suggests that it is building itself, rather than the people within it, that is the opaque threat that must be turned inside out to reveal its secrets. By using the Xaver 800, the troops are thus able to achieve a state of ubiquitous surveillance in which the two enemy targets and the hostage are perfectly rendered visible for intervention.


Fig. 3.6: In a commercial for the Xaver 800, CGI effects transform the building's interior into a digital gridded interface (top). The camera shifts to locate the viewer inside the environment, revealing three targets represented as floating colored blobs (bottom). Screenshots by author.

And yet, underpinning this state of ubiquity is the way in which such targets are made operative within preexisting frameworks of counterterrorism. This is made apparent once the soldiers infiltrate the building. Upon using the device to reveal the hidden space, the visual display of the Xaver 800 is sent to the counterterrorism command center where the blobs are inexplicably, but accurately, interpreted by specialists as the "bad guys" and the hostage. They then instruct the soldiers where to point there weapons as they detonate the door and enter the building. Within this dramatized fictional scenario, patterns in electromagnetic radiation are isolated as targets for intervention within preemptive techniques of warfare. There is no ambiguity in what kind of movement these targets represent, despite the fact that such blobs could be indexing movement of any kind. Indeed, the commercial is reminiscent here of the 2006 study on the Xaver 800 in which Camero admits that operators must be able to intuitively interpret the visual display to determine the difference between human and nonhuman targets. Ultimately, whatever strange affiliations of matter might have forged in the technical and aesthetic dimension of dispersion are suddenly consolidated around forms of terrorist embodiment within US imperial space. The commercial thus reveals how radiation itself becomes racialized; that is, how social difference is marshalled as the primary calculus through which electromagnetism is sensed, interpreted, and acted upon within tactical situations.

Perhaps ironically, then, the AIPAC presentation and commercial reveal their own anxieties about the implication of the radar technologies within the US global politics of counterinsurgency. While intended to represent the Xaver 800 as a post-political surveillance technology for use by military and police, they instead display how TWS are preceded by a regime of power through which terrorist embodiment serves as its primary object of interest. At stake in the technical and aesthetic processes of TWS is less whether any and all movement can

be interpreted as a target than how TWS invoke various imaginaries of terrorist embodiment in order to render legible certain patterns of electromagnetism as targets for intervention within normative scripts of preemption. It does not matter that TWS render the world into a digitally reconstructed three-dimensional display of floating blobs that strips that body of its markers of difference. Those targets will always be organized with a social hierarchy that mobilizes electromagnetism to extend US control over racialized radiation in the name of imperial security.

*A Specter Dispersed*

In their current state, TWS are imperfect surveillance technologies. They cannot penetrate all material, they heavily rely upon the operator's interpretation, and they are prone to identifying false-positive ghosts. And yet, this has not prevented efforts to develop more powerful devices that could achieve ubiquity's promise of full spectrum dominance. In 2020, the US Army issued a white paper seeking information from independent researchers on TWS systems that can "track, locate, isolate, range, and count personnel and animals in a building or structure," as well as "use biometric data to differentiate between friend and foe."[75] Unlike previous handheld TWS devices like the Xaver series, these new devices would be able to deploy biometric capabilities to positively identify targets based on information in federally controlled databases. Before that, in a blog post published in 2015, DARPA announced a new program called Revolutionary Enhancement of Visibility by Exploiting Active Light-field (REVEAL), a system that would exploit information embedded in photons to peer past walls. According to Predrag Milojkovic, program manager in DARPA's Defense Sciences Office, while current imaging systems only take advantage of light intensity to visualize a given environment,

[75] US Department of Defense, "Sense Through the Wall (STTW) System," STTW-20-RFI-01, January 29, 2020, https://sam.gov/opp/23889bcd68074e068c474d986cb476c1/view.

REVEAL would "use mathematical methods to coax from photons a little more of a story about where they've been and what they've seen."[76] And since the early 2000s, DARPA and the DHS have been supporting research into muon tomography, a technique that uses cosmic ray muons to generate three-dimensional images of volumes that normally cannot be penetrated with electromagnetic radiation.[77] While muons thus far have been used to detect the presence of nuclear material inside nuclear power plants and to visualize large architectural structures like the pyramids in Egypt, researchers speculate that muon tomography could also be used for security and counter-insurgency initiatives, like detecting the presence of illegal nuclear weapons held in metal cargo containers in trucks and ships at border checkpoints.[78]

At the same time, the ability for TWS to achieve ubiquity's promise of full spectrum dominance has become a site of increased fascination within popular entertainment media. The ability to see through walls has long been a staple of military, heist, spy, and superhero genres, especially those that orbit around various registers of science fiction. However, in post-9/11 American security culture, this particular ability has experienced a resurgence within similar genres of film, television, and video games, perhaps due in part to the spread of military technology, aesthetics, and ideologies across popular media through what Roger Stahl terms "militainment" in an attempt to foster support for counterinsurgency operations in the War on

[76] This would include, for example, information about photons' previous directional paths and material interactions prior to arriving to the imaging system, which can be deduced by analyzing various "wave-related properties such a coherence, diffraction, and interference." See DARPA, "Shedding Light on Untapped Information in Photons," May 22, 2015, https://www.darpa.mil/news-events/2015-05-22.

[77] Muons are a type of subatomic particle created by particles like high energy protons and atomic nuclei in the Earth's atmosphere colliding with cosmic rays. Traveling faster than the speed of light, muon constantly shower every inch of the Earth's surface. Indeed, about one muon strikes every square centimeter of the Earth every minute at sea level. Importantly, unlike electromagnetic radiation, muons can penetrate nearly every substance, which makes them incredible valuable for tomographic imaging.

[78] See C. L. Morris, et al., "Tomographic Imaging with Cosmic Ray Muons," *Science and Global Security* 16.37-53 (2008): 37-53.

Terror.[79] Consider, for example, recent installments in the transmedia Batman franchise in which Bruce Wayne deploys special optical visors that allows him to locate enemies across complex environments. In the 2008 film *The Dark Knight* from director Christopher Nolan, Batman constructs a "high frequency generator receiver" that can detect sonar signals from cellphones across Gotham City (fig. 3.7). By relaying these signals into his visor, he is able to detect and identify any person across entire buildings from any vantage point in real time. In fact, unlike the Xaver 800, Batman's visor is so sensitive that it can discern the difference between human enemies and their guard dogs, and even reveal facial features. This ability is later replicated in the "Detective Mode" mechanic in the *Batman: Arkham* videogame series, which allows players can see through non-interactive elements of the environment.[80] In *Batman: Arkham Knight* (Rocksteady Studios, 2015), for example, Detective Mode allows Batman to identify enemies, weapons, and other usable objects necessary for mission objectives (fig. 3.8). In fact, the ability is so powerful that it can penetrate through multiple layers of the human body (exposing skin, inner organs, and skeletons), detect the emotional status of enemies based on their heart rate, and identify whether or not enemies are armed.

[79] Roger Stahl, *Militainment, Inc.: War, Media, and Popular Culture* (New York, London: Routledge, 2010), 6.
[80] Within video games, TWS have become a staple mechanic allowing players to detect mission objectives, hidden items, and non-playable characters across complex environments. While early examples of TWS can be seen in the X-ray scope in *Super Metroid* (Nintendo, 1994), thermal goggles in *Metal Gear Solid* (Konami, 1998), and the Lens of Truth in the *Legend of Zelda: The Ocarina of Time* (Nintendo, 1998), this ability proliferated in the twenty-first century as a commonplace trope in many videogames, especially within the action-adventure stealth genre. Notable examples include *Assassin's Creed* series (Ubisoft, 2007-present), *James Bond 007: Blood Stone* (Activision, 2010), *Deus Ex: Human Revolution* (Square Enix, 2011), *Hitman: Absolution* (Square Enix, 2012), *Dishonored* (Bethesda, 2012), *Tomb Raider* (Square Enix, 2013), and *The Last of Us* (Naughty Dog, 2013). In fact, this ability has become so conventional that it is a default mechanic in multiplayer first-person shooters—like the *Halo* series (Xbox Game Studios, 2001-present), *Overwatch* (Blizzard, 2016-2022), and *Apex Legends* (Electronic Arts, 2019)—to assist players in locating their teammates and coordinating group attacks.

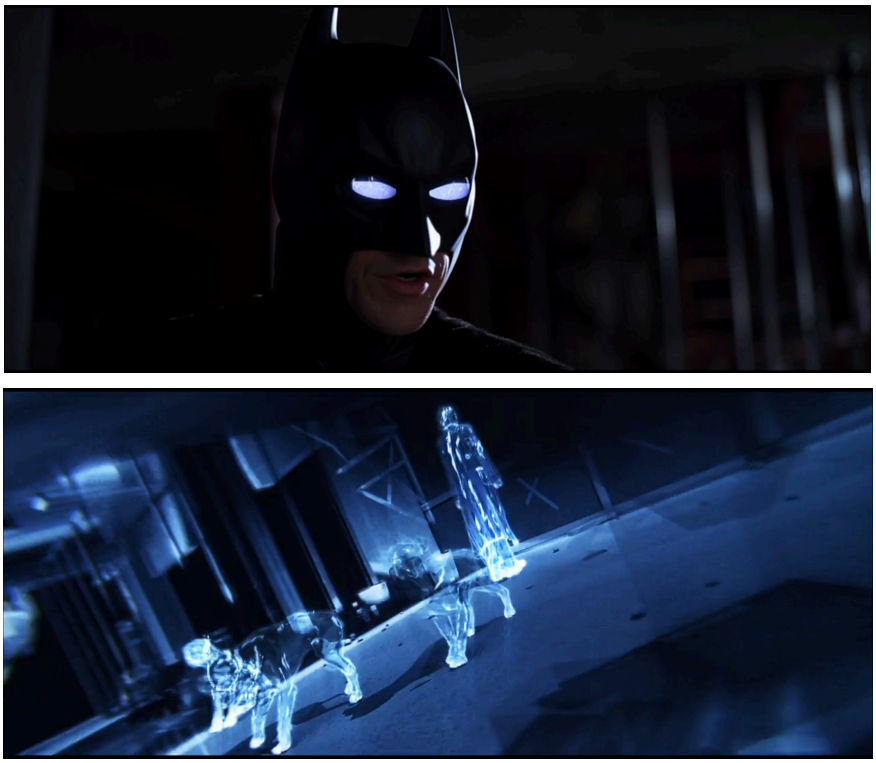

Fig. 3.7: In the film *The Dark Knight* (2008), Batman's visor is equipped with a "high frequency generator receiver" that detects sonar signals of cellphones (top). The high-definition visor allows Batman to see through walls across entire buildings, distinguish between human and non-human bodies, and identify enemies based on facial features (bottom). Screenshots by author.


Fig. 3.8: In the videogame *Batman: Arkham Knight* (2015), players can activate "Detective Mode," which allows Batman to see through walls across the entire environment, locate objects of interest to complete missions, and identify enemies. Screenshot from gameplay video by FA GAMEZ, https://www.youtube.com/watch?v=91Llrj-U3dY.

I conclude with these examples—spanning military research and popular entertainment media—to suggest that the ubiquitous effects of TWS have become desirable, necessary, and inevitable achievements within post-9/11 security cultures. While contemporary devices like the Xaver series have limited visual capacities, such speculative cases would enable complete and total surveillance across all registers of the electromagnetic spectrum, transforming all nearby space into a completely transparent and navigable environment. And yet, we are far from that future. Riddled by the microphysical dynamics of dispersion and other signal propagation effects, TWS produce ubiquity as a medial effect only through their limitations. In this case, I argue that it is precisely here, within the failures of ubiquity, that we might more fully comprehend the conceptual work of dispersion as both a technical and aesthetic form of surveillance politics. While not quite surfacing to the level of disruption or resistance, dispersion might instead allow us to witness the difference manufactured within the thin veneer of homogeneity that shrouds radar technology. As I've shown in this chapter, TWS incorporate signal propagation effects like dispersion in order to construct targets for intervention—targets which are only made legible though the technics of social difference that animate counterinsurgency operations and security culture. And yet, just as much as dispersion consolidates imperial power into TWS devices, enabling them to reproduce any and all matter as targets for intervention, it likewise lays bare how every target is nonetheless the product of a confluence of spectral matter that proliferate in spite of and prior to becoming an image of racialized threat. In this way, dispersion reveals the material fictions that subtend the recruitment of electromagnetism as a ubiquitous medium for state surveillance. Within every image of a spectral target is a specter dispersed.

# CHAPTER 4

## Bordering Play: On Flow in Gamification

On July 28, 2019, three pink seesaws appeared at the border separating the colonia of Puerto de Anapra in Ciudad Juárez and the El Paso suburb of Sunland Park in New Mexico. This particular section of the border wall in the Anapra region was part of an upgrade approved by the Obama administration that replaced the previous chain link fence with an eighteen to thirty foot tall steel bollard structure. Placed between the slats of steel bollards, the seesaws extended outward just above ground level with colorful striped cushions adorning the seats. Soon enough, children and adults began congregating around the pieces of playground equipment, taking turns mounting the seesaws and swinging up and down with someone on the other side of the barrier. However, this didn't last very long. The seesaws were dismantled after about twenty minutes by Mexican soldiers and US Border Patrol agents who monitored the entire event. Then the crowd dispersed.

Entitled *Teeter Totter Wall*, these three seesaws were the product of architecture studio Rael San Fratello, a partnership between San Jose State interior design faculty member Virginia San Fratello and UC Berkeley architecture professor Ronald Rael. Since the early 2000s, Rael and San Fratello have been designing artistic interventions at the US-Mexico border largely in response to the Bush-era Secure Fence Act of 2006, which authorized the construction of hundreds of miles of fencing along the US-Mexico border and the expansion of DHS surveillance programs to deter migrant activity. Rael documents these "counterproposals" in his 2017 book *Borderwall as Architecture: A Manifesto for the US-Mexico Boundary*, which examines the U.S.-Mexico border wall as the "most strategic pedagogical tool and architectural

evidence to rethink resilience and new regional cross-border public sensibility, based on new strategies of interdependence."[1] Oriented around the practice of speculative design, such projects include: a wall with slats comprised of xylophone bars, a wall with an open-air kitchen and counters for dining on both sides, a wall with an attached baseball field, a wall with a library embedded inside, and a wall with a cabin that swings back and forth.[2] With the help of Colectivo Chopeke, a youth-based organization devoted to building community housing within the poorest regions of Ciudad Juárez like Anapra, *Teeter Totter Wall* is the first of these projects that Rael and San Fratello have been able to implement.[3]

While the installation was short lived, the project enjoyed a second life online as photos and videos of the installation taken by the artists and photojournalists went viral on social media. Almost immediately, the project garnered recognition by a host of international media outlets and various humans rights organizations. It appeared, for example, on the April 2020 cover of *PlayRights Magazine* published by the International Play Association, an organization founded in 1961 that, according to its website, aims "to protect, preserve and promote the child's right to play as a fundamental human right." Later that year, *Teeter Totter Wall* was awarded the 2020 Beazley Design of the Year award from London's Design Museum in recognition of how it

[1] Ronald Rael, *Borderwall as Architecture: A Manifesto for the US-Mexico Boundary* (Oakland: University of California Press, 2017), 46; 18.
[2] Alongside speculative interventions at the border wall, Rael also describes two games that similarly emphasize the centrality of play within the politics of migration at the US-Mexico border. In one, Rael redesigns *lotería* cards with icons representing important aspects of the crossing experience, like footprints, family, water, and snakes. In the other, Rael designs a board game wherein players must move their game piece to the other side of the game board (in the middle of which is a border wall) by following tiled paths and responding to various card-related events.
[3] While this was the first time the project was implemented at the border wall, a prototype of *Teeter Totter Wall* was included in "The U.S.-Mexico Border: Place, Imagination, and Possibility," at Craft Contemporary, Los Angeles in 2017. Earlier in 2016, an etching for the project was included in "Insecurities: Tracing Displacement and Shelter" at New York's Museum of Modern Art along with five other pieces by Rael San Fratello.

serves as "an inventive and poignant reminder of how human beings can transcend the forces that seek to divide us."[4]

Since its installation, the project has been largely understood as a critique of border politics and US imperialism with varying degrees of success, either as a vehicle for social justice or a cynical spectacle of toothless activism. In the former, many commentators praised the project as a monument to unity and resilience in the face of increasingly injurious, racist, and divisive polices from the Trump administration, including the expansion of the border wall, the separation of migrant families, and inhumane detention practices (policies that subsequently continued under the Biden administration).[5] The Refugee and Immigrant Center for Education and Legal Services (RAICES), for instance, reposted images of the project on their Twitter, championing the project as "a powerful vehicle for change" and celebrating the work for showing how "We are all connected. We are all one.♡"[6] In this framework, *Teeter Totter Wall* underscores play is a universal experience and liberating activity that can pose a threat to the state and its separatist policies of border security. On the other hand, other critics suggest that the work too easily lapses into a depoliticized spectacle of sentimentalism that masks the very real and very violent effects of US immigration policies.[7] While play might be liberating within

[4] Ryan Waddoups, "Seesaws at the U.S.-Mexico Border Win a Prestigious Design Prize," *Surface Magazine*, 20 January 2021, https://www.surfacemag.com/articles/teeter-totter-wall-us-mexico-border-design-museum-london-prize.

[5] Among these celebrations of the project, the seesaw emerged as a potent symbol of democratization within an otherwise heavily militarized geopolitical terrain marked by centuries of racialized exclusion and capitalist exploitation. In particular, the seesaw symbolically and materially foregrounded the interdependence of the two nations, insofar as actions on one side effect the other. Indeed, Rael himself writes in his book that the seesaw represents the "mutual give-and-take required of two nations whose economic success literally hinges upon their relationship with each other." Rael, *Borderwall as Architecture*, 125. It bears noting too that the color of the seesaw holds symbolic weight: pink is traditionally used by anti-femicide activists in Juárez to remember those women who have been systematically murdered since 1993.

[6] Refugee and Immigrant Center for Education and Legal Services, Twitter post, 29 July 2019, 8:02 p.m., https://twitter.com/RAICESTEXAS/status/1155992122601820162.

[7] Consistent with a more general analysis of the inefficacy of political art, critic Max Pearl writes in *Art America* that the project is merely an instance of "armchair activism" and "tragedy porn masquerading as protest art," wherein "its upbeat message, bright palette, and easy-to-grasp concept [is] irresistible to liberal centrist do-gooders." Pearl in

framework of a participatory aesthetics, at the border, play is incorrigibly constrained by the regulations of security protocol— so much so that it fails to confront the reality of immigration politics, offering only a shallow experience of fun that eclipses resistance, intervention, or material aid. Ultimately, such debates about *Teeter Totter Wall* foreground how play is caught between the universal experience of pleasure and its potential for democratization in games on the one hand, and its ability to be coopted by borders to strengthen uneven systems of national security, digital control, and racialized violence on the other.

In opening this chapter with *Teeter Totter Wall*, my intention is not to defend any particular interpretation of the installation. Rather, my goal is to consider how it stages the cultural politics of play in relation to the cultural politics of ubiquitous surveillance, specifically in the overlap between borders and games. Admittedly, the relation between play and ubiquity might at first seem unlikely. And yet, we might notice how debates about *Teeter Totter Wall* are animated precisely by negotiating the status of play as a universal form of experience that can transcend cultural, social, and geopolitical boundaries. As San Fratello remarks in an interview conducted on occasion of the project's recognition by the Design Museum, "For 40 minutes we were able to show the world that play can be an act of resistance […] Children and adults were connected in meaningful ways, with the recognition that actions that take place on one side have

particular highlights how the artists documented the event with drone recordings and press photographs that were then publicized on their social media, many of which featured smiling young children on the Mexican side of the wall with white American adults on the other. In addition, Pearl argues that *Teeter Totter Wall* willfully misrecognizes of the politics of the US-Mexico border within the physical barrier rather than a set of practices that operate elsewhere, including the detention of South American refugees entering Chiapas from Guatemala or the continued arrest of undocumented immigrant by ICE in American cities like Chicago and New York. In total, the installation risks effacing the material politics of the border by mobilizing play as a symbolic gesture of common humanity. Pearl thus concludes: "Rather than imagine a world with no border wall, these architects can only imagine a fun wall." Max Pearl, "The Terrifying Cynicism of Teeter-Totter Wall," *Art in America*, Jan 21, 2021. https://www.artnews.com/art-in-america/features/teeter-totter-wall-1234581905.

a direct consequence on the other."[8] Here, play is framed as a liberating and transformative aesthetic encounter, a common structure of positive experience that can cohere social groupings even when fractured by state security initiatives. Such an understanding of play recalls that offered by the Dutch historian Johan Huizinga in his famous 1938 book *Homo Ludens: A Study of the Play-Element in Culture*. For Huizinga, play is an elemental component of experience that is "older than culture," a "totality" shared by all humans.[9] As voluntary and purposeless, play is further animated by a "quality of freedom" that allows on to step outside the normative bounds of real life into a "temporary sphere of activity"—what Huizinga calls the "magic circle"—that is marked by its own rhythms, rules, and logics of experience.[10] Put differently, play is an ubiquitous feature of aesthetic life, capable of forging a commons among various social groupings by virtue of a shared capacity for sensemaking and affective relation, particularly within the magic circle of game environments.

In this chapter, I examine the role that play performs as a ubiquitous site of mediation within surveillance systems of gamification, especially at borders. Importantly, when I refer to *play* in the context of surveillance, my aim is not to signal a structure of positive emotion or an experience of gratifying excess, fun, or enjoyment that results from recreation. Rather, I follow Katie Salen and Eric Zimmerman who define play as "free movement with a more rigid structure."[11] Play in this case is an emergent aesthetic process that unfolds both within and in opposition to formalized rules and codified systems of operation, out of which positive emotional

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[8] Tom Ravenscroft, "Design of the Year 2022 winner Virginia San Fratello interview," *Dezeen Magazine*, 19 January, 2021, https://www.dezeen.com/2021/01/19/design-of-the-year-2020-winner-virginia-san-fratello-interview.
[9] Johan Huizinga, *Homo Ludens: A Study of the Play-Element in Culture* (London: Routledge and Kegan Paul, 1949 [1944]), 3; 1. In addition to being a primordial element within life, play for Huizinga is also a "voluntary activity" that bears with it a "quality of freedom" (7). Outside the ordinary world, play is unrestrained by normative convention, a kind of pure and purposeless form of activity that proceeds by its own rules.
[10] Huizinga, *Homo Ludens*, 8. For further analysis of the spatial and temporal dynamics of the magic circle, see Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals* (Cambridge, MA: MIT Press, 2003).
[11] Salen and Zimmerman, *Rules of Play*, 311.

experience like pleasure transpires from spontaneous interaction.[12] My reason for conceiving play in this way is to consider how it consolidates the technological and aesthetic production of surveillance in the fields of games studies and border studies. Put differently, what allows us to think borders and games together as key mediators of ubiquitous surveillance is their relation to play as a universal aesthetic relation emerging from specific modalities of sense perception and embodied performance within various proceduralized systems of behavior.

By examining how gamification is mobilized at sites of border security, I interrogate how the cultural politics of play can be weaponized to produce differential effects of surveillance through the technics of social difference. Defined as the application of gaming mechanics into non-game contexts for optimizing productivity, gamification is typically understood as a neoliberal form of governance that commodifies play within control networks through mechanisms of positive feedback and behavioral priming. Indeed, digital media scholars tend to study the effects of gamification within digital infrastructures of labor like ride-sharing apps in order to show how play, or "playbor," convenes users through the false promise of pleasurable recreation within contrived social networks sustained by constant engagement within specific rule-based forms of action.[13] However, while such critiques are apposite for showing how play is bound up neoliberal systems of affective exploitation and monetization, they nonetheless tend to unwittingly reproduce certain technolibertarian notions of ludification that prescribe to "an idealistic and universalistic notion of play" that, I argue, is unequipped at grappling with the

[12] Here I also refer to historian and theoretician Scott Eberle who defines play as an "emergent process driven by pleasure" that is at once purposeless, voluntary and outside the ordinary, but also defined by certain contrived rules and objectives (231). For Eberle, play is not simply spontaneous free-form activity, but rather shuttles "between regulation and abandon, order and disorder, or contain both forces at once" (216). Scott Eberle, "The Elements of Play: Toward a Philosophy and Definition of Play," *Journal of Play* 6.2 (2014): 214-233.

[13] Julian Kücklich, "Precarious Playbour: Modders and the Digital Games Industry," *The Fibreculture Journal* 5 (2005): https://five.fibreculturejournal.org/fcj-025-precarious-playbour-modders-and-the-digital-games-industry. For a more in-depth discussion of "playbor" as it relates to digital culture and information capitalism, see Trebor Scholz, ed., *Digital Labor: The Internet as Playground and Factory* (New York: Routledge, 2013).

uneven ways in which play is distributed within neoimperial and colonial scenes of geopolitical violence.[14] Rather, by analyzing sites of border gamification alongside scholarship in border studies, I consider how play can be weaponized as a ubiquitous medium for sovereign power that is animated by state-sanctioned violence and territorial performances of racialized surveillance. Thus, by paying attention to borders, we might begin to better understand how gamification—even in the context of business, education, and healthcare—operates as a specific technology of state-making that mobilizes the technics of social difference as a play mechanic to produce different forms political violence.

This chapter begins with an overview of the political and technological dynamics of border gamification through debates in digital media studies that consider how game media function as technologies of control by priming behavior within reward mechanics. Then, turning to the Texas Border Virtual Watch and literature in border studies, I demonstrate how gamified play is not only a productive technique of biopolitical governance for producing citizen-players, but also co-extensive with practices of state violence that occur at territorial sites of nation-building. And yet, by focusing solely on real world sites of border gamification, I argue that we risk overlooking how gamification is less a technical process than a rhetorical one that communicates what rhythms, temporalities, and processual forms of affect are required to reproduce and efface such effects of state violence. In order to account then for the affective politics of play in gamification, I turn in the latter half of the chapter to the video games genre known as *border games*—games that "participate in ludic constructions of homeland and

[14] Payal Arora, "Decolonizing Privacy Studies," *Television & New Media* 20.4 (2019): 373. Jonathan Beller similarly argues that "playbor must never be thought of as the passionate involvement of the gamer whose energetic investment as the quasi-accidental or incidental corollary of producing value. If the term is to be understood at all, it must mean the seeking of satisfaction in the blood sport of the algorithm, in the geopolitical landscape formatted by computational racial capitalism." Beller, *The World Computer*, 299, note 6.

nationhood [by] providing a fictional space for play on and between national borders."[15] In particular, through a close reading of the video game *Papers, Please* (2013) by American game designer Lucas Pope, I demonstrate how the affective dynamics of play are bound up with state violence through the rhetorical framework of flow, which refers at once to the feeling of optimal immersion in play experiences as well as the state of optimal regulation of bodies across border checkpoints. By collapsing these two definitions of flow, border games thus demonstrate how play is marked by the installment of a series of rule-based interactions that modulate affect within the sociotechnical mechanics of state-sanctioned racism. Throughout, I maintain that beyond the ubiquity effects of gamification's magic circle, we find exclusionary zones of suspension, punishment, and detainment where the state distributes violence through play experience.

*The Gamified Border*

While game media have emerged as one of the world's largest entertainment industries in twenty-first century digital cultures, they have also been identified as the latest technology for state and corporate surveillance. As announced by the National Security Agency in a 2008 document revealed in the Edward Snowden disclosures: "GVEs [Games and Virtual Environments] are an opportunity!" According to the NSA, the United States now faces a new threat in the post-9/11 moment as "tech saavy [sic]" terrorists have begun using online video games like the massively multiplayer online role-playing game *World of Warcraft* and the virtual world simulator *Second Life* for recruiting and communication.[16] In an earlier publication from

[15] Melissa Kagen, "Glory to Trumpland! Critically Playing Border Games," *gamevironments* 11 (2019): 24.
[16] See National Security Agency, "Exploiting Terrorist Use of Games & Virtual Environments," 2007, accessed April 14, 2021, http://www.nytimes.com/interactive/2013/12/10/us/politics/games-docs.html.

2007 by Science Applications International Corporation submitted to the NSA titled "Games: A Look at Emerging Trends, Uses, Threats, and Opportunities in Influence Activities," it was likewise acknowledged that first-person shooters like *Half-Life* and alternate-reality games like *Orbital Colony* can be used for terrorist training and strategic planning.[17] And more recently, in a 2021 join report by the FBI and DHS, video game media like first-person shooters were blamed for inspiring white supremacist mass shootings in which fatalities were likened to "scores" and "kill counts."[18] At the same time, however, if games and virtual environments are opportunities for terrorist organizing, they can also be opportunities to extend the reach of homeland security; both reports acknowledge that digital and networked games can also enable federal agencies to influence publics with nationalist propaganda and collect intelligence data. For example, as video games became more a prevalent aspect of everyday life in social networks and mobile phones throughout the 2010s, the NSA and its UK counterpart GCHQ began gathering advertising data from gaming apps like *Angry Birds* to construct user profiles including location, age, gender, income, ethnicity, sexual orientation, and more.[19]

As games have emerged as a new site for combating terrorism in the twenty-first century, they have also become key sites for national security initiatives. This has exceedingly been the case as countries like the United States have used game media to control the transnational flow of migrants, resources, and information at borders. For example, in the early 2010s the Department of Homeland Security invested $1.6 million dollars to test video game technology to

[17] Science Applications International Corporation, "Games: A Look at Emerging Trends, Uses, Threats and Opportunities in Influence Activities," 2007, accessed April 14, 2021, https://archive.nytimes.com/www.nytimes.com/interactive/2013/12/10/us/politics/games-docs.html.
[18] Federal Bureau of Investigation and the Department of Homeland Security, "Strategic Intelligence Assessment and Data on Domestic Terrorism," May 2021, https://www.fbi.gov/file-repository/fbi-dhs-domestic-terrorism-strategic-report.pdf/view.
[19] James Ball, "Angry Birds and 'leaky' phone apps targeted by NSA and GCHQ for user data," *The Guardian*, 28 Jan 2014, https://www.theguardian.com/world/2014/jan/27/nsa-gchq-smartphone-app-angry-birds-personal-data.

improve the operation of Customs and Border Protection.[20] Using the interactive gaming platform Ground Truth developed by Sandia National Laboratories, CBP agents were able to simulate various border crossing scenarios to test threat response strategies in a closed training environments. More recently, DARPA announced Prototype Resilient Operations Testbed for Expeditionary Urban Scenarios (PROTEUS), the visual training software that enables marines to play against one another in various combat scenarios to prepare them for logistical and communicative challenges in future operations.[21] In addition, drone pilots use gaming consoles to surveil borderlands and war zones overseas: the land drone "Dragon Runner" uses the PlayStation controller while early systems for the Predator drone employed an Xbox processor.[22] Beyond virtual simulators, CBP agents can also receive a training certificate in Serious Game Development from the Mason Game & Technology Academy, located a half hour drive from CPB headquarters, in order to assist in creating customized training games. To be sure, such examples build upon a much longer historical narrative that sees video game media as emerging at least in part from the U.S. military's investments in game theory, cybernetics, and systems theory throughout the course of the twentieth century (especially at the RAND corporation) as

[20] Mickey McCarter, "U.S. Border Patrol is Using Video Games Technology to Help Keep Border Safe," *Fox News*, April 29, 2011, https://www.foxnews.com/tech/u-s-border-patrol-is-using-video-games-technology-to-help-keep-border-safe; Fernanda Santos, "The Time I Went on Border Patrol In a Virtual Reality World," *New York Times*, Sept. 12, 2016, https://www.nytimes.com/2016/09/13/us/the-time-i-went-on-border-patrol-in-a-virtual-reality-world.html.

[21] Defense Advanced Research Projects Agency, "PROTEUS Transitions to Marine Corps Warfighting Lab," *DARPA*, June 22, 2021, https://www.darpa.mil/news-events/2021-06-22.

[22] Thomas Stubblefield, *Drone Art: The Everywhere War as Medium* (Oakland: University of California Press, 2020), 3. To be sure, drone piloting is often discussed in terms of video game mechanics and aesthetics (like the first-person shooter), while drone pilots are increasingly associated with masculine gamer figure. Such a figure is often cited as one of a vulnerable or weakened status that engages with conflict on the terms of boredom and shock. See Carrie Elizabeth Andersen, "Games of Drones: The Uneasy Future of the Soldier-Hero in *Call of Duty: Black Ops II*," *Surveillance & Society* 12.3 (2014): 360-376.

well as a broader history of wargaming stretching back to the Middle Ages through the Prussian War in the eighteenth and nineteenth centuries.[23]

Insofar as gaming technologies, mechanics, and equipment are now being integrated into sites of border surveillance, we might say that in the twenty-first century, borders are increasingly becoming gamified. Originating in the digital media industry in the latter half of the 2000s, the term gamification is typically defined as the application of game mechanics into non-game contexts in order to improve productivity, learning, and problem-solving.[24] As a design method that more broadly includes applied games, gamification uses mechanics like leaderboards, points, badges, and other kinds of personalized content to reward the completion of certain kinds of tasks. Apps like Nike+, Foursquare, and Sleep Cycle for example gamify very ordinary activities (running, going outside, and sleeping respectively) through game design elements into order to make them feel more competitive and motivating. In this sense, the design philosophy is best understood as an organizational strategy premised upon playful scenarios of problem-solving, rule-based action, and voluntary participation. Proponents of gamification thus maintain that gamification can (and should) be applied to any issue one can imagine. As game designer Jane McGonigal provocatively suggests, "reality is broken," and games are our final hope for fixing any problem that plagues our world—poverty, hunger, climate change, and

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[23] Clark C. Abt, *Serious Games* (New York: Viking Press, 1970); Philip Mirowski, *Machine Dreams: Economics Becomes a Cyborg Science* (Cambridge: Cambridge University Press, 2002).

[24] Sebastian Deterding, Dan Dixon, Rilla Khaled, and Lennart Nacke, "From Game Design Elements to Gamefulness: Defining Gamification," in *Proceedings of the 15th International Academic Mindtrek Conference: Envisioning Future Media Environments* (New York: ACM 2011), 9-15. There are countless design texts on gamification from industry practitioners. Among these are: Robert Hunter, *The Gamification Handbook: Everything You Need to Know About Gamification* (Brisbane, Emereo, 2011); Gabe Zichermann and Christopher Cunningham, *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps* (Sebastopol, CA: O'Reilly Media, 2011); Karl Kapp, *The Gamification of Learning and Instruction: Game-based Methods and Strategies for Training and Education* (San Francisco: Pfeiffer, 2012); Kevin Werbach and Dan Hunter, *For the Win: How Game Thinking Can Revolutionize Your Business* (Philadelphia: Wharton School Press, 2012); Brian Burke, *Gamify: How Gamification Motivates People to Do Extraordinary Things* (New York: Bibliomotion, 2014).

perhaps too, terrorism—by transforming it into a goal-oriented and collaborative scenario for "structuring experience and provoking positive emotion."[25]

While gamification might lead to more productive and optimal forms of problem-solving, such is only the case because they function as technologies of surveillant control. In his formative 2006 book *Gaming*, Alexander Galloway argues that because video games require players to learn and reproduce a series of actions embedded in code, games structurally exhibit the power dynamics of informatic media that operate within distributed networks of protological governance.[26] In chorus, surveillance scholars have similarly pointed out that games themselves can very often be described as surveillant enclosures that, aside from offering immersive narratives, "function as ordering devices that parse players into manageable and computational units."[27] Key to the way that gamification functions as a form of surveillance is how it uses gaming mechanics to prime individuals in order to produce certain optimal outcomes of behavior.[28] Points, badges, and power-ups are productive in non-game contexts because they tie one's intrinsic desire to an extrinsic reward systems, thus gently nudging the player to pursue certain kinds of actions without explicitly directing what kinds of decisions one should make. In this way, argues Patrick Jagoda, game media and gamification might be better framed as "action-oriented mediations that shape everyday experience through neoliberal principles" insofar as

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[25] Jane McGonigal, *Reality is Broken: Why Games Make Us Better and How They Can Change the World* (London: Penguin Press, 2011).
[26] Alexander Galloway, *Gaming: Essays on Algorithmic Culture* (Minneapolis: University of Minnesota Press, 2006), 92.
[27] Jennifer Whitson and Bart Simon, "Game Studies meets Surveillance Studies at the Edge of Digital Culture: An Introduction to a special issue of Surveillance, Games and Play," *Surveillance & Society* 12.3 (2014): 310. On the relationship between surveillance, games, and gamification, see also: Casey O'Donnell, "Getting Played: Gamification, Bullshit, and the Rise of Algorithmic Surveillance," *Surveillance & Society* 12.3 (2014): 349–59; Alex Dean Cybulski, "Enclosures at Play: Surveillance in the Code and Culture of Videogames," *Surveillance & Society* 12.3 (2014): 427–32; Jennifer Whitson, "Gaming the Quantified Self," *Surveillance & Society* 11.1/2 (2013): 163-176.
[28] As Brian Massumi explains, priming is an "affective politics" that works by "cueing" the tendencies and capacities of the body to adapt it towards some yet undetermined event. Brian Massumi, *Politics of Affect* (Cambridge: Polity Press, 2015), 55.

they condition individual preferences, behaviors, and choices to be scored and ranked within competitive play environments.[29]

Understood as a diagram of surveillant control, border gamification thus is not simply defined by the application of gaming technologies and equipment to border security. Rather, it can more accurately be construed as a form of neoliberal governance that relies upon techniques of incentivization in digital and networked systems to prime mobility within security infrastructures. Consider, for example, airline loyalty programs. At many international airports, airlines now offer frequent flyer points that passengers can trade in predesigned choice architectures for access to exclusive services and upgrades, as well as elevated status in the reward hierarchy. The Miles & Miles program by Lufthansa and other airlines in the Star Alliance allows passengers to accumulate points, called "miles," through their purchases that enable them to receive perks when reaching certain status levels, like access to exclusive lounges, discounted airline tickets, free consumer products, personal assistants, and limousine service. In the US specifically, a number of credit card companies too have partnered with TSA Pre-Check to create a loyalty program that allows passengers to apply for expedited security privileges. Like other gamified design scenarios, airline loyalty programs mobilize mechanics like reward systems and choice architectures to alter how travelers proceed through the social space of the airport. Through game design elements like point systems, badges, and pre-designed choice architectures, airline loyalty programs introduce a "novel mode of behavior regulation" through data collection systems and positive-feedback mechanisms that reinforce certain past actions through reward hierarchies of measured performance.[30] As such, gamification here is less

[29] Patrick Jagoda, *Experimental Games: Critique, Play, and Design in the Age of Gamification* (Chicago: University of Chicago Press, 2020), 12.
[30] Nikolas Schrape, "Gamification and Governmentality," in *Rethinking Gamification*, ed. Mathias Fuchs, Sonia Fizek, Paolo Ruffino, and Niklas Schrape (Lüneburg, meson press, 2014), 30.

about introducing positive emotional experiences into border security than it is about transforming play into an quantifiable form of interactive behavior within a formalized system of operation that can be shaped to produce optimal performances of security.

Considered from the perspective of digital media studies, border gamification systems like airline loyalty programs thus regulate play in voluntary and interactive control systems in order to strengthen national security protocol. What results from this mobilization of play are a set of ubiquity effects within the magic circle of gamification. Here, ubiquity refers less to the increased presence of digital surveillance technologies through the widespread application of gamification across social life, and more so to the feeling that gamification can potentially benefit anyone who voluntarily submits themselves to becoming primed within choice architectures pre-designed by corporate and state actors. Indeed, such is the case with airline loyalty programs that promise increased mobility and premiere access to anyone who willingly engages in screening protocol through entrepreneurial forms of rational decision-making and self-management. In this case, gamification works through environments of primed play to make universal appeals to its own use, function, and benefits—especially as a method of problem-solving which can be applied to any issue, including national security.

However, such an approach risks neglecting how borders themselves are highly straited zones of political violence that—gamified or not—are charged with protecting the nation-state from external and internal threats. Even as much as gamified loyalty programs regulate behavior at border security infrastructures, they don't do so evenly. While most loyalty programs are free to join, and ostensibly universally accessible, their appeals to status and privilege build upon

certain racialized performances of security at screening checkpoints.[31] In her analysis of US security culture, Rachel Hall demonstrates how "airports treat all passengers as suspect (threatingly opaque) until they perform voluntary transparency, or demonstrate readiness-for-inspection."[32] To become secure is thus to distance oneself from the racialized position of the terrorist who disrupts the demands for total transparency. In much the same way, insofar as they are extensions of how security checkpoints already prime travelers to accord to racialized hierarchies of risk, gamified loyalty programs require passengers to voluntarily make themselves available within technologically-mediated security performances of whiteness to attain status and privilege. Thus, if gamification can produce ubiquity effects at borders, this is only the case because it makes discrimination the by-product of voluntary individual choice through design principles like reward mechanics rather than a key feature of border protocol. In what follows, then, I turn to debates in border studies to consider how border gamification conjoins techniques of behavioral modification with the exercise of political violence. In doing so, I demonstrate that missing from discourses of gamification in digital media studies is an analysis of how control's flexible networks of behavioral regulation intersect with the exercise of sovereign power within the cultural politics of play.

*Violence Beyond the Magic Circle*

For all of its novelty, gamification does not introduce completely novel forms of control at borders. Rather, borders use game design principles in order to extend upon certain durable forms of state sovereignty that continue to impact marginalized communities in and beyond

[31] Much has been written about the forms of discrimination and bias that unfold at airport security checkpoints. For some of this work, especially from the field of surveillance studies, see: Magnet, *When Biometrics Fail*; Browne, *Dark Matters*; Selod, *Forever Suspect*; Beauchamp, *Going Stealth*.
[32] Hall, *Transparent Traveler*, 8.

borderlands. If the systems, practices, and technologies of game media can be said to introduce novel forms of control and neoliberal governance at borders under the framework of gamification, they do so only by intensifying the state's overall mission to surveil, track, and detain migrants in the service of a mobility biopolitics and territorial militarized violence. As political geographers Reece Jones and Corey Johnson explain:

> New technologies and hardware, government funding and the adoption of military culture combine to allow the expansion of state security practices in areas that were once beyond the reach of the state. This is not emblematic of the retreat of the state or the end of sovereignty, but rather is the re-emergence and expansion of the idea of the territorially bounded state and sovereign power narrated, performed and enacted through violence at the border.[33]

At stake here then is less what novel form of behavioral control gamification introduces into border security than how borders use gamification to re-entrench sovereign authority over flows of migrant mobilities. To borrow from the eternal words of Gloria Anzaldúa, borders do many things, but ultimately they practice a logic of state-sanctioned racism that "define[s] the places that are safe and unsafe, to distinguish us from them."[34] Following suit, I argue that play, as an apparently voluntary, purposeless, and universal structure of experience, enables both the ubiquity effects of the magic circle and the violences that rage beyond it.

In what follows, I consider how debates about the exercise of control in gamified borders can in fact be understood within a larger discourse in border studies concerning the vexed status of sovereignty in increasingly globalized networks of communication, trade, and mobility. Before moving forward, however, it's important to clarify that I do not intend to argue that borders and games stage oppositional techniques of power that must be reconciled when brought

[33] Reece Jones and Corey Johnson, "Border militarization and the re-articulation of sovereignty," *Transactions of the Institute of British Geographers* 41.2 (2016): 197.
[34] Gloria Anzaldúa, *Borderlands / La Frontera: The New Mestiza* (San Francisco: Aunt Lute Book Company, 1987), 3.

together at sites of gamified border security. Rather, by interrogating how border gamification consolidates concepts of territorial authority and extrajudicial violence, I build upon work in digital media studies that considers how state sovereignty is (re)mediated within control diagrams as a kind of hybrid power where political violence is continually staged through digital and networked media.[35] In this case, I consider how gamification as a diagram of control and borders as sites of state sovereignty are two sides of the same coin of neoliberal governance. As Elizabeth Povinelli argues, neoliberalism (or in her work late liberalism) weaves a social world of "differential belonging" in which state executive power makes some forms of life productive at the same time that other forms of life are rendered expendable within certain striated zones of neglect.[36] In the winners-and-losers game of neoliberal governance, the individual succeeds through entrepreneurial forms of rational decision-making and self-management that lead to the accumulation of wealth, status, and power. In the case of gamification, such policies manifest in the player's ability to optimize behavior to yield certain kinds of lucrative rewards. In the context of borders, however, those very same economic regulations have long conditioned migrant experiences through extreme conditions of economic precarity, structural adjustments, and privatization. Here, the focus on the entrepreneurial individual renders migration an individual choice and thus a cultural flaw, rather than a process of structural violence that unfolds within varying "economies of dispossession" that delimits racialized life within capitalist and colonial

[35] Here I primarily follow Benjamin Bratton who tracks how the global configuration of computational technologies, what he calls "The Stack," has installed a new kind of political geography through which older diagrams of state authority are remediated. As he explains, "the implication is not another prophecy of the declining state withering away into the realm of pure network, but to the contrary: the state's ongoing redefinition is now undertaken in relation to network geographies that it can neither contain nor be contained by." Benjamin Bratton, *The Stack: On Software and Sovereignty* (Cambridge: MIT Press, 2015), 11.
[36] Elizabeth Povinelli, *Economies of Abandonment: Social Belonging and Endurance in Late Liberalism* (Durham: Duke University Press, 2011), 30.

regimes of property and value.[37] If game media and gamification are thus material cultural forms to neoliberalism, at borders we begin to witness how this is only the case within an expanded field of racialized political violence through which the state reclaims sovereignty over territory, law, and the body.

In order to consider how gamification intersects with state sovereignty through modes of technologically-mediated play, consider another example of border gamification: the Texas Border Virtual Watch (TBVW). Launched in 2008 by the US government and the state of Texas in collaboration with the private security company BlueServo, TBVW is an interactive website that allows any with internet access to log into a network of two hundred webcams outfitted along the US-Mexico border that display a 24/7 livestream of various migratory routes along the border. Placed on the border wall itself and on the private property of willing citizens, these cameras enable the public to perform as border agents by monitoring surrounding territory for suspicious activity. After logging the time and location of any perceived event, users can then alert the Texas Border Sherriff's Coalition who then decide if and when to take action. The platform amassed over 200,000 volunteers and logged over 5,000 incidents before ending in 2012 due to lack of financial support. Despite it ceasing operation, however, surveillance studies scholars argue that TBVW marks a shift in the border politics where the public is recruited to participate in border security. For Hille Koskela, TBVW applies a strategy of "responsibilization" in which individual citizens are called upon to assume capacities of border enforcement previously only conducted by state and federal authorities, while Doug Tewksbury considers how the platform produces "citizen-soldiers" that is consistent with a move towards

[37] Jodi Byrd, Alyosha Goldstein, Jodi Melamed, and Chandan Reddy, "Predatory Value: Economies of Dispossession and Disturbed Relationalities," *Social text 135* 36.2 (2018): 1-18.

individual responsibilities to state in post-9/11 security culture.[38] Crucial here is the interactive nature of the networked platform which allows individuals to monitor and report activity in real-time. If before border security operated through media spectacles that brought into visibility the material practices of border enforcement for publics at a geographic remove from security infrastructures, with TBVW such spectacles are no longer passively consumed fantasies but rather sites of action and sensemaking.[39]

While TBVW does not make use of explicit gaming mechanics, it nonetheless represents a case of border gamification by creating a designed environment for proceduralized play. What makes the platform unique is how it uses strategies of crowdsourcing to manage collective labor within a decentralized and distributed network. While users didn't get immediate feedback in terms of points or monetary compensation, they were nonetheless incentivized to engage border security as an experience of primed play by directing their labor within a collaborative and competitive environment. Indeed, the interactive nature of the platform spread over to a community Facebook group (active from 2010-2013) where users would share screenshots of CCTV cameras, corroborate information, and strategize about how to best distribute monitoring duties. In their collaborate art project, *The Virtual Watchers*, artist Joanna Moll and anthropologist Cédric Parizot document these exchanges as well as reveal the broader video

[38] Hille Koskela, "Did You Spot an Alien? Voluntary Vigilance, Borderwork and the Texas Virtual Border Watch Program," *Space and Polity* 14.2 (2010): 103-121. Hille Koskela, "'Don't mess with Texas!' *Texas Virtual Border Watch Program* and the (botched) politics of responsibilization," *Crime Media Culture* 7.1 (2011): 49-65. Doug Tewksbury, "Crowdsourcing Homeland Security: The Texas Virtual BorderWatch and Participatory Citizenship," *Surveillance & Society* 10.3/4 (2012): 249-262.

[39] Juan Llamas-Rodrigues, for example, argues that border security is always a "media spectacle," a performance of state sovereignty that takes place through specific ideological mediations of exclusion. Media images of border crossers, tunnels, caravans, walls, and so on are key to the way that state agencies and media production companies construct national discourse about homeland security for publics removed from the border site. Ultimately, Llamas-Rodrigues, such media spectacles efface the material violences that incur due to borders, including the deaths of migrants who attempt to cross the border as well as broader spate of ecological damage to natural landscapes and non-human life. Juan Llamas-Rodrigues, "Tunnel Risk and the Mediation of Border Security Spectacle," in *The Routledge Companion to Media and Risk*, ed. Bishnupriya Ghosh and Bhaskar Sarkar (New York: Routledge, 2020), 303-313.

game logics of the platform interface. Much in the same way as drone piloting mirrors video games, TBVW too brought a distant border terrain into the one's domestic space as a site where action could be implemented without consequence to the user. In this case, Moll writes, TBVW's success in recruiting participants "relied in its capability of 'gamifying' the border, which led to a silent militarisation of its users through a recreational activity."[40]

My purpose in highlighting TBVW as a privileged case of border gamification is due to the way that the platform directly implicates state violence within control networks of incentivized participation. On the one hand, it's possible to interpret TBWV as an indication of how gamification actually compromised the authority of the nation-state by blurring the boundaries between individual, police, and military agencies at the border wall. For political scientist Wendy Brown, TBVW "provides an instance of dissemination of state sovereignty" insofar as it outsourced state authority to citizens.[41] By licensing individuals with the power to surveil and possibly lead to the detention of migrants along the US-Mexico border, TBVW suggest that the state itself is no longer equipped to protect the realm and must enlist less qualified vigilante agents to resurrect some semblance of authority over territory, law, and the body. In addition, we might also consider how Brown's argument applies to other sites of gamified border security, like airline loyalty programs. By assuming the responsibility from federal authorities for enforcing proper mobility in airports, such programs redistribute the responsibilities of national security protocol to the individual traveler who must self-modulate behavior within specific technological systems of play designed and managed by software corporations, data brokers, credit agencies, and other non-federal entities.

[40] Joanna Moll and Cédric Parizot, "The Virtual Watchers," *Exposing the Invisible*, January 18, 2017, https://exposingtheinvisible.org/en/articles/the-virtual-watchers.
[41] Wendy Brown, *Walled States, Waning Sovereignty* (New York: Zone Books, 2010), 88.

While I concur with Brown that projects of border gamification like TBVW demonstrate how older forms of sovereignty are challenged by more recent transnational flows of mobility, I argue that gamification is actually one way in which the relation between the state and sovereignty is rearticulated within control networks. As scholars in political geography have more recently argued, sovereignty is no longer concerned with defending the walled territory from outside threats, but rather wields the absolute and exceptional right to restrict movement through the exercise of militarized political violence, whether that occurs at the border itself or elsewhere.[42] Consistent with Judith Butler's work on "resurgent sovereignty," such scholarship argues that within the twenty-first century many nation-states strategically suspend international law in the name of security in order to refortify borders as part of the War on Terror, economic isolationism, anti-immigration policies, and militant white supremacist ideologies.[43] For example, in her analysis of the US-Mexico Border following the Secure Act of 2006, Juanita Sundberg argues that the border wall itself produces a "zone of exception" where CBP claims extralegal powers in order to arbitrarily stop and search migrants, stripping them of their rights and sometimes their life.[44] Similarly, Linda Alvarez observes how neoliberal policies on

[42] For many contemporary studies of borders in political geography, an investment in the waning of state sovereignty in an apparently globalized borderless world has failed to recognize how boundary-making still serves as a key technique of state power for organizing social space, as well as to determine what life qualifies as worth protecting and which does not. See, for example: Derek Gregory, "The black flag: Guantánamo Bay and the space of exception," *Geografiska Annaler* 88 (2006): 405-427; David Newman, "The lines that continue to separate us: borders in our 'borderless' world," *Progress in Human Geography*, 30.2 (2006): 143–161. Corey Johnson, et al., "Interventions on rethinking 'the border' in border studies," *Political Geography* 30.2 (2011): 61-69; Karen Till, et al., "Interventions in the political geographies of walls," *Political Geography* 33 (2013): 52–62; Jones and Johnson, "Border militarization and the re-articulation of sovereignty"; Reece Jones, *Violent Borders: Refugees and the Right to Move* (London, New York: Verso, 2016).

[43] As defined by Judith Butler, "resurgent sovereignty" marks the ways in which the "procedures of governmentality, which are irreducible to the law, are invoked to extend and fortify forms of sovereignty that are equally irreducible to law" (54-55). For Butler, sovereignty is an anachronist form of power that finds new life in extra-legal techniques of governmentality. It is not that a sovereign power literally suspends the rule of law (like a king), but that the act of suspending the rule of law through techniques of governmentality "produces sovereignty *in its actions and its effects*" (66). Judith Butler, *Precarious Life: The Powers of Mourning and Violence* (London, New York: Verso, 2004.

[44] Till et al., "Interventions in the political geographies of walls," 55.

migration in Central America have "turned borders into zones of profit" that "maintain and normalize violence in order to preserve an established social order at the expense of these migrants."[45] In cases like these, border walls are no doubt a performative enactment of a heteropatriarchal militarized nation-state, but they are also sites where the state exceeds the law to violently enforce its authority.

Within the context of resurgent sovereignty, the TBVW emerges a key platform through which sovereign power is newly articulated insofar as the sociotechnical control networks of gamification build upon previous forms of territorialization and state-making at the US-Mexico border. On the one hand, the fact that the online interactive platform places responsibility in the individual to monitor suspicious activity should not indicate a retreat of state authority as the US has long emboldened and militarized vigilante groups to police the southern border. As noted in a 2006 Congressional report, civilian patrols date back at least to the forced acquisition of Mexican territory in the nineteenth century where self-appointed rangers would police the territory before Border Patrol was established in 1924—and of course such efforts have only persisted since in various border militia groups, like the Civilian Materiel Assistance, Ranch Rescue, American Border Patrol, The Minuteman Project, and Save Our State.[46] Rather than threaten to undo federal authority over borderlands, vigilantism is in fact a key technique through

[45] Linda Alvarez, "No Safe Space: Neoliberalism and the Production of Violence in the Lives of Central American Migrants," *The Journal of Race, Ethnicity, and Politics* (2020): 30; 4.

[46] Stephen Vina, Blas Nunez-Neto, and Alyssa Bartless Weir, "Civilian Patrols Along the Border: Legal and Policy Issues," CRS Report for Congress, RL 33353, 7 April 2006, https://sgp.fas.org/crs/homesec/RL33353.pdf. In her account of the gendered dimensions of vigilantism at the US-Mexico border, Jennifer Johnson observes how vigilantism is a key technique of exclusionary projects that aim to define the boundaries of the national community. And while many of these movements are undertaken by private citizens, the "gate-keeping project" of anti-immigrant vigilantism is nonetheless "spearheaded by the state and manifest most directly in policies that tighten security at the US-Mexico border and criminalize undocumented immigration." Jennifer Johnson, "'Border Granny Wants You!': Grandmothers Policing Nation at the US-Mexico Border," in *Border Politics: Social Movements, Collective Identities, and Globalization*, ed. Nancy Naples and Jennifer Mendez (New York: NYU Press, 2015), 36. See also Roxanne Doty, *The Law into Their Own Hands: Immigration and the Politics of Exceptionalism* (Tuscon: University of Arizona Press, 2009).

the state claims exceptionalism to the law insofar as such groups simultaneously operate outside juridical frameworks and yet also collaborate with CPB by detaining migrants and sharing information. In this longer tradition of vigilantism, TBVW is less a means of diminishing the state's monopoly on decisionism and violence than it is of enlisting the individual to voluntarily surveil the border in order to embolden the expanse of US power over migrant mobilities.

On the other hand, the technological foundations of TBVW too are consistent with much longer projects of nation-building and American imperialism that took up cybernetics to structure the border as an information system for mobility surveillance. While scholars note that what makes TBVW unique among contemporary border control infrastructures is how it wields an interactive and decentralized network for managing collective labor, the gamified platform is in fact only one among many experiments in transforming the US-Mexico border wall into a "virtual fence," including for example the Secure Border Initiative Network (SBInet) project from 2006 which imagined the borderland as a totalizing network of remote sensors that could capture and track movement.[47] And prior to SBInet, the US government experimented with cybernetic systems in the 1970s to create an electronic signal detection system at the Southern border that drew heavily from militarized interventions in Vietnam borderlands as part of what Iván Chaar-López calls an "imperial control fantasy."[48] Such border control networks foreground how the interactive capacities of TBVW are inscribed within a longer history in which the US government has attempted to police immigration flows through real-time feedback systems of data transmission.

[47] Tamara Vukov and Mimi Sheller, "Border work: surveillant assemblages, virtual fences, and tactical counter-media," *Social Semiotics* 23.2 (2013): 225-241.
[48] Iván Chaar-López, "Sensing Intruders: Race and the Automation of Border Control," *American Quarterly* 71.2 (2019): 495-518.

Taken together, the history of vigilantism and cybernetic control at the border precede the ways in which platforms like TBVW mobilize gamification design principles in order to enlist the individual user to perform border security on behalf of the state. If there is anything novel about TBVW, it is how it draws upon the cultural dynamics of play—as something universal, apolitical, or primordial—in order to provide cover for the extension of the state's authority through the resposibilized user. Through gamified design strategies, TBVW casts border control as a site of voluntary free labor within a competitive environment of information sharing, and in doing so the state is able to enforce its authority without taking responsibility for whatever decisions an individual may decide to make. No doubt, such are the precise aims of platform politics: to shift accountability from an overarching legal structure to some standardized control schema consolidated into networked form. As Benjamin Bratton writes, "a platform's regularity is often guaranteed less by laws than by technical protocols, and this is one of several ways that the sovereign decision is built into the platform's interfacial partitions and surfaces."[49] In the case of gamified border security platforms, play becomes a site of mediation for surveillance through which individuals are primed towards some end goal of migrant surveillance without the state explicitly commanding what decisions one should make. From the perspective of the nation-state, the sovereign decision over territory, the law, and life just seems to happen: an inconsequential outcome of many individual forms of interaction taking place simultaneously in the network regardless of the user's location, political orientation, or personal objectives.[50] And, from the perspective of the user, the capacity to report suspicious activity not only feels voluntary and self-motivated, but also like an emergent process of play driven by experiences of

[49] Bratton, *The Stack*, 44.
[50] While it was in operation, TBVW logged a range of international users, from countries like Mexico, Colombia, Israel, New Zealand and the UK. Media outlets were often quick to point out that a particularly devoted contingent of users were Australian pub patrons.

pleasure. “This is fun,” remarks one person in the community Facebook group where TBVW users share information about their latest arrest, while another fantasizes about a remote surveillance system that allows one to discharge weapons on suspected border crossers, much like a drone pilot or a video game (fig. 4.1).


Fig. 4.1: Images from Joanna Moll and Cédric Parizot’s ongoing interactive installation *The Virtual Watchers* (2016), which documents comments from the community Facebook group for the Texas Border Virtual Watch. http://www.virtualwatchers.de. Screenshots by author.

In my reading of TBVW and related systems like airline loyalty programs, I have sketched out how border gamification stages how frameworks of control in twenty-first century digital and networked media can be understood within a broader set of debates in border studies about the status of state sovereignty within a globalized network of information flows. As I have demonstrated, at borders, gamification emerges as *a neoliberal form of governance that enlists the cultural politics of play to buttress and efface the state’s exercise of sovereign violence*. That

is, what animates gamification here is how play, as a ubiquitous form of aesthetic life, can be primed in order to deflect the state's accountability in propagating political violence towards the responsibilized user. Play masks the differential effects of gamified surveillance at borders insofar as it makes incentivized behavior appear voluntary and purposeless. And yet, what remains unexplored here is how this rearticulation of sovereignty occurs on the scale of play experience. To be sure, play is not simply an outcome of various protological mechanisms, but rather unfolds through sense perception and embodied performance. And gamification is not simply a technical procedure, but also operates as an affective politics that regulates the social through priming and behavioral modulation. Thus, by shifting emphasis from the technological to the affective dimensions of gamification, I argue that we can more fully track how ubiquity effects are produced through the rhythms, temporalities, and processual forms of affect that are imbricated within the construction of the citizen-player.

*Border Games and the Rhetorics of Flow*

In order to examine the affective dynamics of border gamification and its relationship to state violence, I turn in the remainder of this chapter to a close reading of play within the video games genre of border games, in particular the independently-produced puzzle simulator *Papers, Please* by Lucas Pope. In doing so, I maintain that border games do not simply represent borders in games, but instead remediate the normative affective dynamics of gamification that have increasingly come to mark global border security regimes. Put differently, border games remediate national security protocol through a series of rule-based modes of interaction, and in doing so reveal how gamification is a rhetorical process that communicates how the individual should self-modulate behavior within action-oriented modes of embodied performance. And,

ultimately, through an analysis of flow, I show how gamification renders social difference as a play mechanics that enables the player to act as a distributed agent of state sovereignty authorized to inflict political violence.

Border games are a category of video game media that employ gameplay mechanics, storytelling elements, and audiovisual design to thematize the experience of crossing geopolitical, social, and cultural boundaries.[51] Spanning a range of genres, modes, and platforms, the political orientation of border games is highly varied. Very often, border games—for example, *Crosser* (Rafael Fajardo 2000)*, Borders* (Gonzalo Alvarez 2017), *Bury Me My Love* (The Pixel Hunt 2017), *The Waiting Game* (ProPublica, 2018), and *Life is Strange 2* (Dontnot Entertainment 2018-2019)—follow a character or group of characters who are themselves in transit, thereby conveying the ethical and emotional dimensions of the immigrant and refugee experience. At the same time, many other border games—including *The Migrant Trail* (Gigantic Mechanic 2014), *Liberty Belle's Immigration Nation* (iCivics, 2014)*,* and *Border Officer* (Cocopo 2019)—position players in the role of immigration officer who must regulate migrant mobilities by verifying identity documents and patrolling land.[52] Despite exploring a broad range

[51] In many respects, border games are recognizable for remediating the political, discursive, and symbolic dimension of the border, often by centering immigrant and refugee experiences. However, as is the case with any genre, the boundaries of what we might call border games are porous enough to include a wide range of interactive or rule-based media organized around the aesthetic and discursive dimensions of *crossing*. These include for example: the classic *Oregon Trail* (MECC 1985), wherein players roleplay as settlers attempting to survive their journey across the Western United States; the interactive text-based game *Border Zone* (Infocom 1987) in which players must prevent the assassination of an American ambassador at the border between the peaceful nation of Litzenburg and the Soviet-controlled Frobnia; "serious games" like *Mission US: City of Immigrants* (Thirteen/WNET 2015), an educational series that teaches students about the immigrant experience in New York City; *Phone Story* (molleindustria 2011) which tracks the movement of smart phones across global circuits of labor and consumption; and Electronic Disturbance Theater's performance intervention *Transborder Immigrant Tool* (2007), an app-based civil disobedience project that sent poetry, information on food and water, and updates on security activities to migrants traversing the US-Mexico border.

[52] One particularly heinous example of a border game that positions the player in the role of the border agent is the 2002 Flash-based game *Border Patrol*, which was created anonymously and circulated widely on chat forums and later social media outlets. In the style of light gun shooter games like *Duck Hunt* (1984) and *Virtua Cop* (1994), *Border Patrol* requires players to shoot Mexican immigrants portrayed in highly racist stereotypical caricatures as they try to cross the border into the United States. The game was met with immediate backlash online, inspiring petitions to remove the game from the internet. It's important to note that while it is very easy for border games to

of relations within and against borders, what is consistent across such games is how they mobilize specific rule-based systems of activity, visual graphics, audio mixing, storytelling techniques, temporal sequencing, and controller design to render the discursive and symbolic dimensions of citizenship and nationhood as sites of play. In doing so, border games can be situated within a larger discourse in game studies that considers how video games are imbricated within projects of nation-building insofar as they condition players to internalize a set of rules and mechanics bracketed by ideologies of global capitalism, settler colonialism, and imperialism.[53] As Juan Llamas-Rodriguez demonstrates through an analysis of the first-person shooter *Call of Juarez: The Cartel* (Ubisoft 2011), by creating narratives that prompt players to uphold the border against racialized migrants, border-themed video games "use digital modes of representation and interaction" in order to "encode the racialization processes that continue to shape popular imaginings of the border."[54]

Released in 2013 for Microsoft Windows and OS X and in 2014 for Linux and iOS, *Papers, Please* is a paradigmatic border game insofar as it renders the national border into a ludic interface for procedural action. Taking place in the year 1982 at a checkpoint leading in to

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slip into racist and xenophobic narratives of migration, this is not representative of the entire category. Many border games, even those in which the player assumes the role of a border agent, attempt to portray experiences of crossing (at borders or elsewhere) in ethical or sensitive ways. Of course, insofar as they are staged within the mis-en-scène of the nation, it is nevertheless a consistent feature of border games to interrogate and proceduralize capitalist, colonialist, and imperial ideologies.

[53] Game studies in more recent years has seen new scholarship on the relationship between video games and cultural studies, particularly the ways that video games remediate and proceduralized histories and ideologies of capitalism, colonialism, imperialism with particular attention to theories of race, gender, class, sexuality, and disability. Key texts here include: Galloway, *Gaming*; Nick Dyer-Witheford and Greig de Peuter, *Games of Empire: Global Capitalism and Video Games* (Minneapolis: University of Minnesota Press, 2009); Matthew Payne, *Playing War: Military Video Games After 9/11* (New York: NYU Press, 2016); Suraya Murray, *On Video Games: The Visual Politics of Race, Gender, and Space* (London: Bloomsbury Publishing, 2017); Souvik Mukherjee, *Videogames and Postcolonialism: Empire Plays Back* (Basingstoke: Palgrave Macmillan, 2017); Jodi Byrd, "'Do they not have rational souls?': consolidation and sovereignty in digital new worlds," *Settler Colonial Studies* 6.4 (2016): 423-437; Christopher Patterson, *Open World Empire: Race, Erotics, and the Global Rise of Video Games* (New York: NYU Press, 2020).

[54] Juan Llamas-Rodriguez, "First-Person Shooters, Tunnel Warfare, and the Racial Infrastructures of the US-Mexico Border," *Lateral* 10.2 (2021): https://csalateral.org/issue/10-2/first-person-shooters-tunnel-warfare-racial-infrastructures-us-mexico-border-llamas-rodriguez/

the fictional country of Arstotzka, players assume the role of an officer who must process entrants attempting to cross the border, including citizens of Arstotzka, as well as those of neighboring countries including Kolechia, Obristan, Antegria, Impor, Republia, and the United Federation. Gameplay in *Papers, Please* consists of a single task: verifying identification papers, work visas, vaccination records, and other documents to filter migrants who may cross from those who may not (fig. 4.2). Entrants are authorized to pass through the checkpoint if there are no discrepancies in their materials, which include details like name, passport number, expiration date, issuing cities, height, weight, and so on. If any inconsistencies surface, players are prompted to pursue further interrogation—including additional questioning, body scanning, and fingerprinting—which more often than not results in rejection or detention. Each morning the player receives an official bulletin from the Ministry of Admission and an updated rulebook that stipulates new guidelines for screening, which may include requiring revised documents or barring entry from citizens of specific nations. Throughout the twelve hour shift, one must be on their guard to deter certain racialized figures of threat—the terrorist, the undocumented laborer, the drug smuggler, the diseased, the counterfeiter, the serial killer—that continually form the basis of Arstotzka's security protocol.


Fig. 4.2: In *Papers,* Please (Lucas Pope, 2013), players verify documents and are given an option to detain migrants if they find discrepancies. Screenshot by author.

Like most border games, *Papers, Please* depicts the border as a site of mobility filtration that at once enables certain experiences of crossing while denying others. However, what sets it apart from other primary examples of border games is how it remediates the process of border security as one of gamification. Rather than highlight a specific narrative, character, or historical event, *Papers, Please* instead uses choice architectures and extrinsic reward systems (like points, achievement badges, and upgrades) to prime behavior in such a way as to uphold national security protocol. In this way, *Papers, Please* is representative of a particular sub-category of border games which integrate reward mechanics into border infrastructures in order to define goal-oriented modes of play and clear parameters of victory. For example, in the casual game *Airport Scanner 2* (Kedlin Entertainment 2017), players scan luggage in order to locate contraband (fig. 4.3). By accurately identifying illegal objects, players earn points and time bonuses that are turned into TSA achievement badges indicating high scores and tokens that can be traded for upgrades to the scanner. Failure to do so penalizes the player insofar as they lose points, payment, badges, and other opportunities to upgrade or access different levels, ultimately

leading to a game over if the player fails to detect a sufficient number of security threats. Similarly, in the serious game *The Arcade Wire: Airport Security* (Persuasive Games 2006), players are given a list of prohibited items that they must flag within travelers' luggage, including usual items like weapons as well as more absurd items like seashells and hummus. While meant to be satirical, the game likewise constructs border security protocol as a binary reward structure within a constrained choice architecture that encourages players to self-regulate behavior in order to maintain the proper mobility of people across the checkpoint. Similar reward mechanics are likewise found in other so-called "paper games" inspired by the success of *Papers, Please*, including *Bad Papers* (Koniki 2019), *Black Border* (Bitzooma Game Studio 2020), and *Contraband Police* (Crazy Rocks, 2021), all of which involve cross-referencing documents to verify migrant identities in order earn points and rewards.

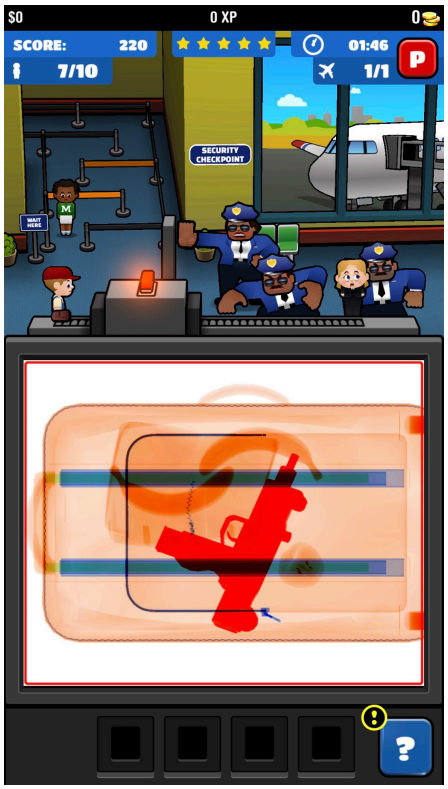


Fig. 4.3: In *Airport Scanner 2* (Kedlin, 2017), players must identify contraband in passenger luggage in order to earn points and unlock achievements. Screenshot by author.

In *Papers, Please*, the extrinsic reward system similarly primes the player's behavior to construct a normative framework of security protocol that must be maintained in order to progress. In this way, the game is less invested in accurately portraying migratory experiences in borderlands than it is in remediating the way that affect is captured, regulated, and commodified within gamification processes as border infrastructures and other sites of national security. As game studies scholar Daniel Johnson observes, *Papers, Please* operates as a kind of "affect labor game, one that inhabits the overlapping space between work and play and intersects with the trend toward gamification of work and the extraction of labor from leisure activities."[55] Consider, for example, the payment scheme. Rather than being paid per hour or with a set salary (as is the case with real-life border laborers like CBP agents or TSA screeners), players are compensated for each entrant processed correctly and therefore lose credits when incorrectly stamping an entrant's passport. Each decision the player makes when processing an entrant (either "accept" or "deny") results in credits either earned or lost. At the end of each workday, players are presented with a tally of how many credits they earned by correctly processing entrants, accepting bribes, or detaining migrants (fig. 4.4). At this point, players must decide how to allocate their savings to pay for food, rent, heat and other incidentals that occur throughout the game's narrative. The game abruptly ends if the player has a negative balance or if every family member dies due to insufficient living conditions. Through this binary reward system, the game structures play experience as a normative accomplishment wherein the successful operation of the border is contingent upon a "good" inspector that can be primed to conform to the procedural models of national security. Much like in real-world gamified border systems, *Papers, Please* indexes the way that gamification processes transform affect in late-capitalist systems of

[55] Daniel Johnson, "Animated Frustration or the Ambivalence of Player Agency," *Games and Culture* 10.6 (2015): 593-612.

neoliberal governance into a state of primed play in order to reinforce the performance of the border as a site of state power.[56]

Fig. 4.4: In *Papers, Please* (Lucas Pope, 2013), players are given a salary at the end of each work day and must decide how to allocate their earnings to support their family and pay for other incidentals. Screenshot by author.

Importantly, what's key about the extrinsic reward system in *Papers, Please* is how it not only primes behavior, but also proceduralized one's actions in order to create optimal gameplay experiences. Indeed, to maximize earnings and avoid a game over, players must scan documents as quickly as possible, retain a state of intense concentration, and skillfully manipulate the controllers to cut down on wasted time. Put differently, in order to optimize their play experience, players are encouraged to enter into a state of flow. As defined by psychologist Mihály Csíkszentmihályi, flow is an optimal state of performance in which one is fully immersed

[56] Matthew Kelly takes a similar approach to *Papers, Please*, deftly analyzing how the game dilates the "work/play/subjectivity connection" within globalist capitalist paradigm and technolibertarian ideologies. In doing so, Kelly locates the game's politics in exposing the political and aesthetic logics of immaterial labor by pushing the economic pragmatism of social interactions to its extreme. However, even while referencing gamification in passing, Kelly too closely follows Lucas Pope's lead and does not consider how the game interfaces with border politics more broadly. I aim to consider how the game more specifically mediates gamification processes at sites of nation-building like borders, and how gamification draws upon and extends certain procedural models of racialized security, sovereignty, and violence. Matthew Kelly, "The Game of Politics: Examining the Role of Work, Play, and Subjectivity Formation in *Papers, Please*," *Games and Culture* 13.5 (2018): 459-478.

in a state of energized focus, resulting in heightened pleasure and a transformation in one's sense of time.[57] In the case of video games like *Dance Dance Revolution* and *Overcooked*, flow describes an experiential state in which one is completely absorbed in play, which not only suppressions any frustration one might feel in maneuvering difficult sequences, but also prevents errors and thus a game over. Importantly, as Braxton Soderman warns, while flow in video games might lead to feelings of pleasure, within the context of gamified scenarios of play within contemporary participatory culture, flow potentially operates a site where capitalist forces reap value from one's intrinsic motivation and pursuit of fun.[58]

In *Papers, Please*, flow is actively facilitated by the game's controls and design elements that persuade players to develop routinized patterns of movement and habits of scanning in order to maximize their earnings within the extrinsic reward system. As each migrant enters the booth, the game's diegetic soundtrack fades out. This not only removes otherwise distracting events beyond the inspection booth, but also signals to players when they must ready themselves to focus intently on their labor. In addition, over the course of the game players are given the option to purchase booth upgrades that make use of specific controls. Not only do these upgrades cut down on the time it takes to process an entrant, but they modulate one's play style into a highly methodical set of movements. In my own experience of play, I noticed how the booth upgrades transformed the nonconscious motion of my fingers into an efficient and habitual procedure.[59] To

[57] Mihály Csíkszentmihályi, *Flow: The psychology of optimal experience* (New York: Harper Perennial, 1990).
[58] Braxton Soderman, *Against Flow: Video Games and the Flowing Subject* (Cambridge: MIT Press, 2021).
[59] My own encounter with *Papers, Please* was through the Steam platform on a 2015 Macbook Pro running on macOS10.14. Players may also access the game through a special iPad version which uses a different control system, like tapping and swiping on the screen. For example, while the computer version contains upgrades for the inspection booth that make use of the keyboard and mousepad, the iPad version's upgrade allows players to use multitouch to move several documents at once. However, despite differences in the modes of dexterity required in each version, players are nonetheless encouraged to develop patterns of attention and movement to process as many documents as possible in the workday. It's important to note that the achievement of flow is also contingent upon one's physical ability, prior experience with video game media, and gaming console or machine. Thus, flow might appear differently for each player as a site of intuitive action or increasing frustration.

admit or reject an entrant, I learned to instinctively tap my pinky finger against the tab key on my laptop to pull out the passport stamps, while I impulsively hit my thumb against the space bar to activate inspection mode to corroborate information in the documents. Even the slightest blunder is costly; not only could I potentially receive a citation for incorrectly processing an entrant, but perhaps more importantly I also risk breaking my state of flow. In fact, flow is such a crucial part of the play experience that one veteran player in the Steam community created a "flowchart of operations" that can guide players to correctly assess any entrant that arrives the border (fig. 4.5). Importantly, such a diagram productively misrepresents the flow experience as a simple if/then algorithm that promises to transform one's subjective decision-making process into a highly rational and systematized method that seemingly evacuates the need to perform any conscious or intentional action. In this way, the flowchart helps us glimpse how flow is not only a technical relation that emerges from proceduralized behavior, but also aesthetic one that unfolds in the psychological and affective contours of play.

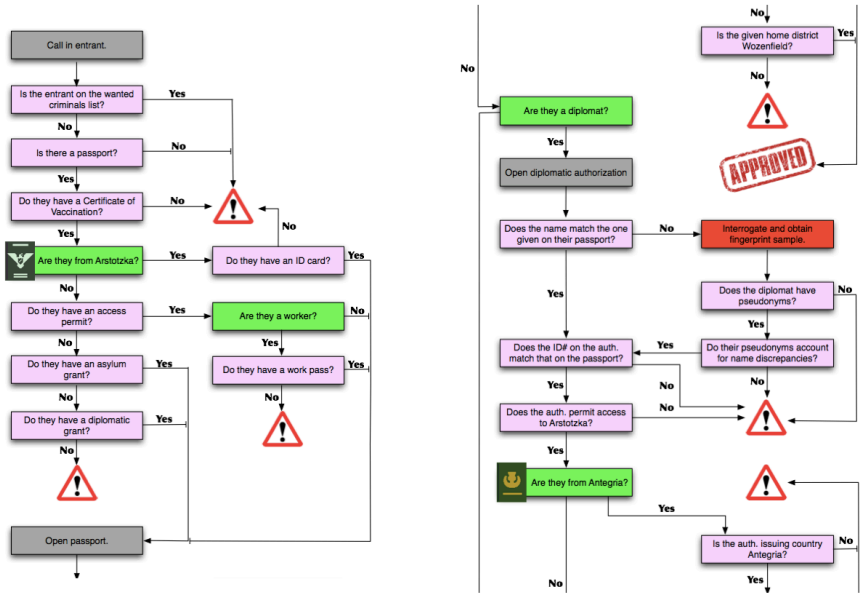

Fig. 4.5: Two non-continuous excerpts from the "Endless Mode Flowchart of Operations" developed by the Steam user Saint Lucifer. The entire flowchart can be accessed at: https://steamcommunity.com/sharedfiles/filedetails/?id=189888707.

However, while flow is necessary in order to earn credits in *Papers, Please*, within the game's political framework, flow accomplishes something else. By making the successful operation of the border contingent upon the player's capacity to internalize certain rule-based processes, the game renders *player flow* as *border flow*. Much in the same way as flow is conceived in game studies as an aesthetic process that emerges out of proceduralized behavior, flow in the domain of border aesthetics is not simply a technical description of how bodies, objects, and information pass through checkpoints, but also a performative enactment of state power through biopolitical techniques of mobility filtration. Such is the case more generally within the post-9/11 American landscape of border securitization. As Lisa Parks observes, the airport checkpoint "normalizes non-exclusion through the imperative of movement—it invites free movement only to use it as a mechanism for scrutinizing and sorting racialized bodies in the name of their future potential behavior."[60] In this framework, flow operates a key site through which the US reasserts its hegemony on the global stage by regulating which kinds of bodies, resources, and information are secure enough to have free movement across the checkpoint and which are not.[61] A diagram of operations from the CBP website demonstrates precisely how borders rely upon the performance of flow in order to make border mobility appear as a smooth and unfettered procedural process despite the potential experiences of violence that inhere within it (fig. 4.6).

[60] Parks, *Rethinking Media Coverage*, 66.
[61] Thomas Wilson and Hastings Donnan, eds., *A Companion to Border Studies* (Malden: Wiley-Blackwell, 2012); Nancy Naples and Jennifer Mendez, eds., *Border Politics: Social Movements, Collective Identities, and Globalization* (New York: New York University Press, 2015).

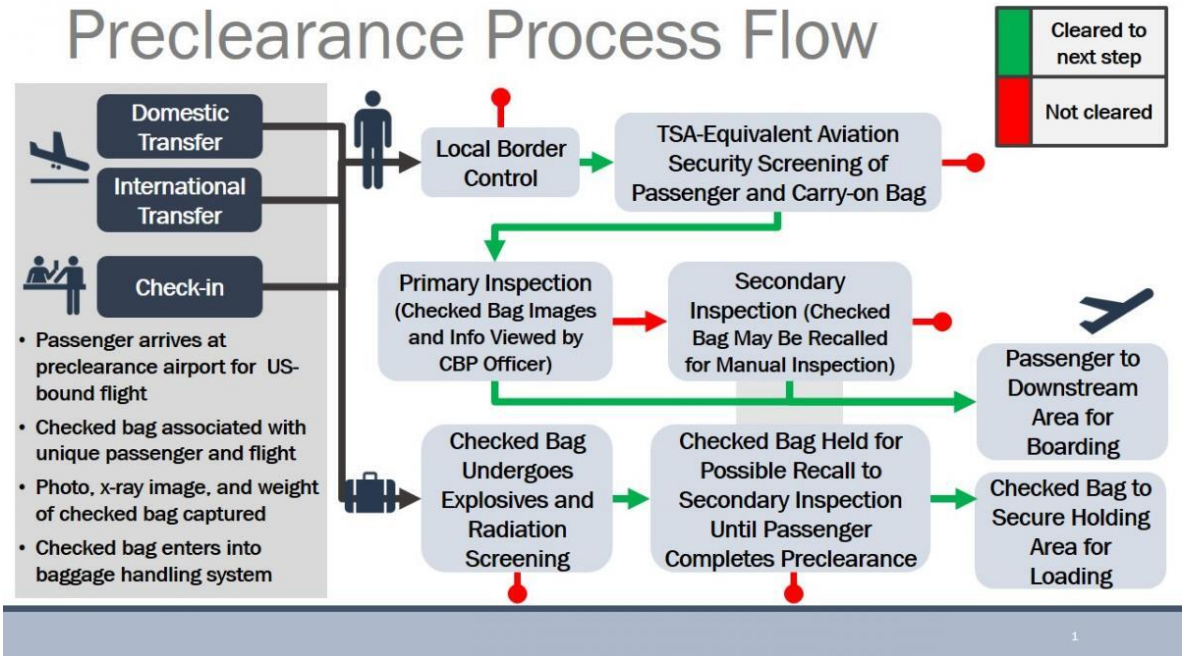


Fig. 4.6: A flowchart of operations at US airport security checkpoints. From the U.S. Customs and Border Protection website. https://www.cbp.gov/frontline/frontline-preclearance.

By conflating player flow with border flow, I argue that *Papers, Please* thus dilates how gamification is less a technical fact made possible by gaming systems, practices, or mechanics than it is a *rhetorical process* that communicates state power through the individual's capacity to be primed within the protocol of border security. On the one hand, border studies has long characterized bordering practices as a "rhetorical process" that consists of "demarcating and defining identity and social space."[62] We might thus consider how borders are already game-like insofar as they are "performative and audience-directed," emerging from the "strategic interaction[s] between border enforcers and border crossers."[63] However, beyond the game metaphor, I argue that *Papers, Please* specifically remediates the neoliberal logics of gamification at work in contexts of border security as a rhetorical process. Here I refer to the way

[62] Josue David Cisneros, *The Border Crossed Us: Rhetorics of Border, Citizenship, and Latina/o Identity* (Tuscaloosa: University of Alabama Press, 2014), 3.
[63] Peter Andreas, *Border games: policing the U.S.-Mexico divide* (Ithaca: University of Cornell Press, 2000 [2009]), xiv.

that game media enact a procedural rhetoric through rule-based and interactive environments of play that conveys how various conceptual structures operate, including social, political, and economic systems. As Ian Bogost explains, "procedural rhetoric is the practice of persuading through processes in general and computational processes in particular."[64] Video games use code to construct arguments about particular processes by persuading players to engage in dynamic models of behavior. A game like *Animal Crossing: New Horizons*, for example, doesn't simply represent the procedural models of commerce and debt central to capitalist systems, but makes these processes interactive, and in doing so encourages players to develop a set of strategies for engaging in such models.

Similarly, *Papers, Please* not only represents the procedural model of flow as it informs contemporary national security politics but also mobilizes specific game mechanics, design elements, and control schema to render flow a site of play within the frame of human experience. Flow is not simply an experiential site of pleasure or an expression of personal agency, but emerges an affective interface that communicates how one should self-regulate behavior to conform to the action-oriented environment of border security. And by turning the procedural model of flow into a play dynamic, the game reveals how gamification operates as a key technology in processes of nation-building insofar as it creates a rhetorical link between the state and the individual, in turn constructing national security as a personal responsibility. Ultimately, then, *Papers, Please* demonstrates how flow is complicit is producing effects of ubiquitous surveillance within gamification systems by proceduralizing certain kinds of affective dynamics

[64] Ian Bogost, *Persuasive Games: The Expressive Power of Videogames* (Cambridge: MIT Press, 2007), 3. In a short yet provocative article published in *The Atlantic*, Bogost explains that gamification is primarily a rhetorical process that derives its power "from the '-ification' rather than from the 'game.' -ification involves simple, repeatable, proven techniques or devices: you can purify, beautify, falsify, terrify, and so forth. -ification is always easy and repeatable, and it's usually bullshit." Ian Bogost, "Gamification is Bullshit," *The Atlantic*, August 9, 2011, https://www.theatlantic.com/technology/archive/2011/08/gamification-is-bullshit/243338.

to that naturalize rational decision-making and optimized self-management within the citizen-player. In this case, ubiquity indexes of how gamification mediates aesthetic life in such a way as to efface evidence of its own operation, making flow at once feel gratifying and achievable by anyone. Indeed, in *Papers, Please* (and even in TBVW), flow renders the feeling of state violence quotidian and pleasurable insofar as the successful operation of the border is contingent upon one's feelings of focus, desire, and triumph. In this way, the game clarifies how play emerges as a key medium for state surveillance that can be weaponized to maintain security protocol and embolden the state's monopoly on migrant mobilities and, ultimately, violence.

*The Mechanics of Social Difference*

Through the rhetorics of flow, *Papers, Please* demonstrates how the systems, practices, and technologies of game media transform sites of nation-building like borders through control diagrams specific to neoliberal forms of governance. However, *Papers, Please* is unique among other border games like *Airport Scanner* or *Border Patrol* insofar as it eschews the kind of digital systems that constitute much of today's borders. Set in the year 1982, the game highlights technologies that are notably more antiquated: paper documents, ink fingerprinting, and film photography and radiography—not to mention the wall itself, the most enduring analog technology of border security. In doing so, the game inserts a strange anachronism within the sociotechnical relations of control societies. Yet, this anachronism is not so much flawed as it is pedagogical—a reminder that contemporary technologies do not introduce completely novel forms of control at borders so much as they extend upon certain durable forms of sovereignty, territorialization, and state-making that continue to impact marginalized communities in and beyond borderlands. To be sure, whatever mechanics and practices of game media might be

introduced in border security training and screening only extend upon the rule-based protocol of citizenship that governs mobility at ports of entry, one bracketed by the normative contours of racialized and gendered embodiment. In this case, flow (both as a play state and a condition of border politics) is not simply contingent upon the presence of digital technologies that optimize behavioral management. Rather, I argue that *Papers, Please* demonstrates how social difference enters into the rhetorical process of flow as a mechanic that primes one's experience of play at the same time that it facilitates the exercise of violence upon racialized and gendered migrants. Important here are less how gaming systems, design elements, or controller schema are imported into non-game contexts than the way in which borders introduce vectors of social difference into gamification as technical elements—indeed, as play mechanics—that regulate how action unfolds in future-oriented risk environments.

To witness of social difference emerges as a technics within flow, consider how *Papers, Please* encourages players to activate various personal and cultural experiential frameworks to interpret migrant identities. Throughout the game, players are tasked with processing entrants' identities as "paper doubles" encoded in various media artifacts of bureaucratic authority (like passports, access permits, work passes, asylum grants, vaccination certificates, and diplomatic authorizations). As described by historians Uma Dhupelia-Mesthrie and Margaret Allen, the paper double refers to the way that identity is constructed through various textual and visual technologies of record keeping and biometrics across a range of post-colonial networks, authoritarian governments, settler regimes, and democratic societies.[65] Importantly, unlike its contemporary counterpart of the data double which is often the subject of gamification discourse,

[65] Uma Dhupelia-Mesthrie and Margaret Allen, "Controlling Transnational Asian Mobilities: A Comparison of Documentary Systems in Australia and South Africa, 1890s to 1940s," in *Making Surveillance States: Transnational Histories*, ed. Robert Heynen and Emily van der Muelen (Toronto: University of Toronto Press, 2019), 135.

the paper double is not a disembodied profile of information processed by digital computers, but instead is articulated between the document and the physical body: "the physical presence of the body was mandatory in this surveillance—the body had to be seen."[66] The paper double is thus not an artifact of automated digital processes, but is constructed by the human agent. In this way, the game reflects more broadly how border security (gamified or not) is always a performance that takes place between humans and technologies, especially contemporary digital systems like millimeters wave scanners, biometric passports, and facial recognition software that claim to be unbiased mediators of risk and mobility governance.[67] Gamification renders this process as a form of play, and in doing makes interpretation of the paper double seem voluntary and volitional even when an intentional design element of gamified nation-building.

In *Papers, Please*, players must exercise a certain degree of judgement when comparing the migrant's paperwork to their body, their speech, and other kinds of bureaucratic information in order to maintain a flow state. However, in the process, players are prone to activating certain normative frameworks of identity and embodiment in order to process migrants as quickly and efficiently as possible. For example, every once in a while, players encounter entrants who must be screened for an apparent discrepancy between the sex listed on their passport and their gender presentation (which in the context of the game is signified either through one's name, clothing, facial features, or hairstyle). To proceed, players use the x-ray tool to scan the entrant's body. Threats are confirmed if the scanner reveals a body sexed differently than the passport (what the game's border protocol refers to as "invalid gender"), thus prompting the border agent to reject the entrant or even detain them (fig. 4.7). If the scan shows a body sexed in the same way as the

[66] Dhupelia-Mesthrie and Allen, "Controlling Transnational Asian Mobilities," 135.
[67] Louise Amoore, "Biometric borders: Governing mobilities in the war on terror," *Political Geography* 25 (2006): 336-351.

passport, then the discrepancy is cleared and the entrant is allowed to pass (fig. 4.8). Here *Papers, Please* reflects what Nicholas Clarkson has characterized as a fundamental "incoherence" in how trans and gender non-conforming identity is assembled, distributed, and monitored across the heterogenous technologies of the post-9/11 security state.[68] Within the U.S. legal apparatus, documents like passports and driver's licenses affix identities to bodies differently than biometric technologies like airport scanners. While proof of medical bodily modification is required to receive a change in sex designation on identification documents, biometric scanners register such bodily changes as anomalous to the traveler's gender presentation as perceived by TSA agents. Crucially, such incoherence is not a mistake, but rather an incredibly productive mechanism for constructing gender non-conformity as duplicitous and deviant within national security logics within and against the racialized figure of the terrorist.[69]


Fig. 4.7: In *Papers, Please* (Lucas Pope, 2013), players are sometimes presented with discrepancies between the sex listed on the passport and the scan of the entrant's body. Screenshot by author.

[68] Nicholas Clarkson, "Incoherent Assemblages: Transgender Conflicts in U.S. Security," *Surveillance & Society* 17.5 (2019): 618-630.
[69] Beauchamp, *Going Stealth*; Fischer, *Terrorizing Gender*.

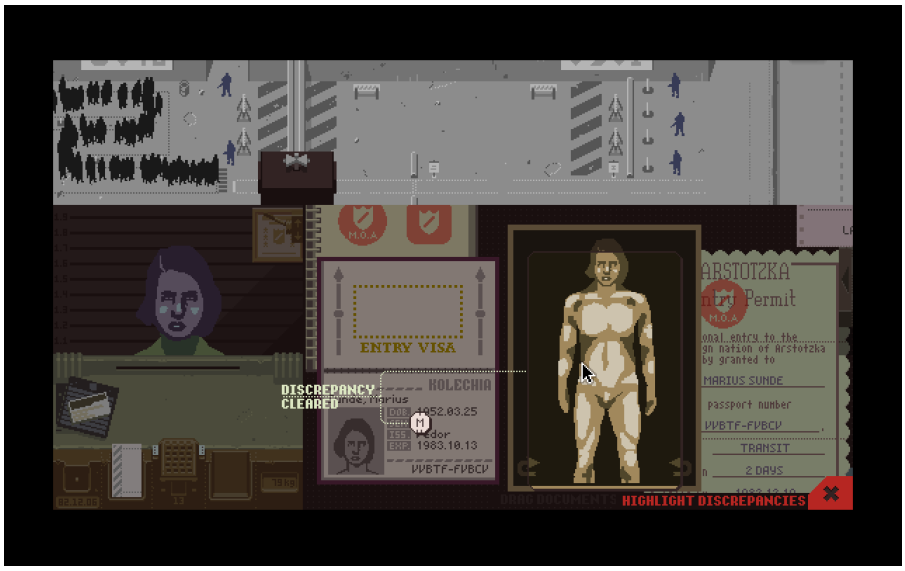

Fig. 4.8: In *Papers, Please* (Lucas Pope, 2013), players can use an x-ray scanner to resolve discrepancies in gender and sex. Screenshot by author.

In highlighting how *Papers, Please* coerces players to interpret the paper double based on categories of gender and sex, I don't intend to cite transness as the ever queerer object that troubles the ethical and political frameworks of border security. Doing so would not only make trans and gender non-conforming persons repeatedly bear the burden of exposing the power structures that underpin national security, but would also imply that all trans and gender non-conforming people are equally legible to surveillance systems in the same way. Rather, I point to such moments because they foreground how gamified borders distribute the responsibilities of the state among multiple actors who are primed to make choices that align with dominant procedural models of nationhood and political representation. To remain vigilant and achieve a state of flow, players must attune themselves to scrutinizing casual markers of gendered and sexed embodiment alongside the more innocuous details like passport number or expiration date. Here the attribution of threat to any one entrant is not simply a technical artifact of a mere discrepancy among documents. Rather, threat and security emerge as a procedural accomplishments in medial form when players make decisions as to how a migrant's documents

should be fabricated, circulated, interpreted within racialized hierarchies of mobility surveillance.

Such is the case too even when the more obvious markers of social difference are absent from the game's representational frame. In *Papers, Please*, the player's ability to interpret the paper double is similarly contingent upon one's ability to memorize key pieces of information which allows one to process documents faster and thus optimize their earnings. While most of the information that one might want to memorize is fairly simple (like the current date or the design of authorization seals), far more troublesome are the three issuing cities within each country where citizens obtain their passports. At first, players must flip through the rulebook when each migrant enters the checkpoint in order to ensure that there isn't a discrepancy with the issuing city, which in this case comes in the form of an unlisted city or a slight misspelling (e.g. "Lesrenadi" misspelled as "Lasrenadi").[4] However, over time players might realize that some cities intuitively seem to belong to certain countries based on perceived real world references. For example, fans of the game have speculated that the country Impor (with issuing cities including Enkyo, Haihan, and Tsunkeido) is intentionally modeled upon a Far East nation, particularly Japan where Pope has lived for many years.[5] In my own play experience, I similarly postulated that the United Federation emulates the United States on account of having a blue passport that bears an emblem resembling an eagle or star with corresponding issuing cities including Great Rapid, Shingleton, and Korista City. In addition, I further speculated that Obristan (with issuing cities including Skal, Lorndaz, and Mergerous) perhaps resembles an Eastern European nation while Antegria (St. Marmero, Glorian, and Outer Grouse) approximates a country in the Caribbean. What these associations reveal is that the player's sensory and affective attunement of primed play is contingent not only upon certain mechanics like payment

schemes and control upgrades, but also upon one's ability to activate procedural models of cultural, linguistic, and ethnic difference. In my own play, these associations importantly derived from my own experience of American citizenship as refracted through the political and historical framework of US imperialism. To be sure, it's not that these fictional cities and countries *actually* resemble real places, or that Pope intentionally modeled the game this way. Rather, in order to stabilize one's experience of flow, players are encouraged to fabricate certain heuristics for memorization based on a relatively shallow set of linguistic and cultural signifiers that register the political and cultural dimensions of one's play experience.

In moments like these, *Papers, Please* reveals how gamification mobilizes social difference as a mechanic that modulates play within dominant notions of nationhood and political representation. Importantly, this has significant implications for how we understand play to be productive medial site for gamified surveillance. As a mechanics within gamification, social difference not only reinforcing dominant identity frameworks of gendered and racial embodiment at gamified borders, but also brackets what kinds of experiences of primed play are possible to maintain the performance of flow. Just as airport security practices are maintained by performances of whiteness within various screening technologies (both by screeners and travelers alike), so too is play in border gamification differentially distributed, experienced, and enjoyed along axes of social difference. *Papers, Please* makes this evident by appealing to certain procedural models of cultural, linguistic, national difference, thus suggesting how perhaps only certain kinds of players or play styles might find success through experiences of flow. In turn, the game demonstrates how gamification weaponizes flow in order to introduce a split in the social space of border security between the primable and the unprimable—or rather, those worthy of being primed and those not. In effect, then, flow is neither an emergent

transcendent structure of positive experience nor even an optimized form of behavioral entrainment in control networks. Rather, flow manifests as a heavily striated zone of affective governance that can be made valuable within the racializing architecture of border security on the very supposition that play is ubiquitous.

Ultimately, by yoking the experience of flow to the technics of social difference, gamification intensifies the exercise of sovereign violence through practices of extralegal political exclusion. Again, we can turn to *Papers, Please* to witness how, at borders, the flipside of flow is political violence. Throughout the game, players are given the option to detain migrants who present discrepancies in their documents. Such is the case, for example, for migrants that don't align with heteronormative standards of gendered embodiment. Once the player cross-references the necessary information to uncover the incongruity, the player can press the detain button that pops up in the checkpoint booth, thus immediately halting the screening process. Importantly, the option to detain is often deliberate: players do not have to detain entrants in every case but can instead simply reject the migrant's passport and let them be on their way. However, players are eventually primed to detain migrants even if this choice seems antithetical to their morals. Not only are players given credit bonuses for each entrant they detain, but the detain button overrides all other actions in the checkpoint booth, thus intensifying one's experience of flow since the player can process more migrants in the workday. In this case, the game exhibits how, at borders, violence is a condition of possibility for the maintenance of flow as an experience of primed play.

In consolidating flow through the exercise of violence, *Papers, Please* reflects how gamified borders more broadly occlude the operation of sovereign violence through the individual's ability to be primed with networks of digital control. Such is a common critique of

drones where the sovereign decision to kill is embedded, often unconsciously, within the operator's ability to successfully maneuver a virtual interface through various controller mechanics, much like a videogame.[70] Similarly, in the case of gamified border platforms like TBVW, users were incentivized to report activity in order to remain competitive and increase engagement within the network platform and associated social media groups. Insofar as the stated goal of TBVW was to deter illegal activity like drug trafficking through increased CCTV cameras, such violence appeared as a product of the platform's crowdsourcing design elements rather than state authority. And yet, as video games like *Papers, Please* suggest, political violence is not merely a technical derivative of gaming mechanics and systems, but rather underpins the affective dynamics of flow that make gamification valuable to state sovereignty. Through gamification, the state need not explicitly define how it will exert its authority over territory, law, and life. Rather, by enabling experiences of flow though the technics of social difference, gamified borders make such violence seem inevitable, even fun.

*Failing, For Now*

Borders, wrote philosopher Étienne Balibar at the turn of the twenty-first century, are "dispersed everywhere."[71] Indeed, through digital and networked media—including biometrics, predictive analytics, and data mining, and robotics—borders have become virtual datascapes that

[70] Adam Rothstein remarks that the relationship between drones and videogames hinges on the way that both render the world as a virtual space available for action and intervention: "the distance between the operator and the missile is a virtual space, existing and maintained entirely by technology networks. In the same way that the virtual world of a video game can dissolve in a second with the failure of a broadband or electrical network, the effect that drones have in the world can be lost just as quickly" Adam Rothstein, *Drone* (New York: Bloomsbury, 2015), 128. While the violence of video games is in no way tantamount to the material violence inflicted by drones, we might nonetheless consider how both transform the world through computational interfaces into a navigable field of information, a virtual space, that makes violence legible as the manipulation of data. Patrick Jagoda has termed this "the violence of abstraction: a pervasive logic that underlies the digitization of the world via computers or the bloodless dimensions of Cold War nuclear politics." Jagoda, *Experimental Games*, 148.
[71] Étienne Balibar, "World Borders, Political Borders," *PMLA* 117.1 (2002): 71.

extend the juridical formations of sovereign violence anywhere state agencies gain access to population-level information.[72] Within these developments, gamification promises to manifest the speculative promise of security not only within increasing technical structures of digital surveillance, but also at the level of affect within individual play experiences. If borders are everywhere, and if gamification can be applied to any problem (including terrorist prevention), then border gamification emerges as a ubiquitous diagram of power in which state security can be accomplished through voluntary and interactive behavior within rule-based control schema.

Importantly, such futures of border gamification might not necessarily appear as explicitly labeled gaming scenarios geared towards national security initiatives. Rather, like the TBVW, they can involve simulated encounters of counterinsurgency enabled by crowdsourced activity within digital interactive environments. Think, for example, of the classic 1985 science fiction novel *Ender's Game* by Orson Scott Card in which the titular character unknowingly destroys an alien planet thinking he was only playing a simulator. Or, more recently, Alex Rivera's 2008 film *Sleep Dealer* in which labor is exported across the US-Mexico border through biologically integrated haptic circuits that control robots. In this latter case, the national border is secured not only by confining immigrant laborers to specific sites of reward-induced behavior, but also by drone pilots that patrol the border from remote locations and target threats through forms of digitally-mediated action. Such scenarios of course are for the moment hypothetical scenes of national and planetary security. However, they gesture towards the possibility for constructing ubiquitous security regimes that enact violence through flows of

[72] Following Balibar, David Lyon similarly writes of the ubiquitous potential for digital surveillance technologies to maintain borders: "the 'border is everywhere' – it is both portable (the plastic card) and virtual (the database)." David Lyon, "The border is everywhere: ID cards, surveillance and the other," in *Global Surveillance and Policing: Borders, Security, Identity*, ed. Elia Zuriek and Mark Salter (Devon, UK: Willan Publishing, 2005), 66. See also Holger Pötzsch, "The emergence of iBorder: bordering bodies, networks, and machines," *Environment and Planning D: Society and Space* 33 (2015): 101-118.

primed play. One need not look further than more recent crowdsourced challenges from DARPA to see how gamification is mobilized to incentivize public research to develop new surveillance systems for the future. In the Fast Adaptable Next-Generation Ground Vehicle (FANG) Challenge, DARPA challenged engineers from the public to submit novel designs for military vehicles to earn cash prizes. Similarly, in the Subterranean (SubT) Challenge, teams of researchers select robots powered by artificial intelligence to complete tests in underground virtual environments in order to help troubleshoot surveillance systems for future tactical missions (fig. 4.9).

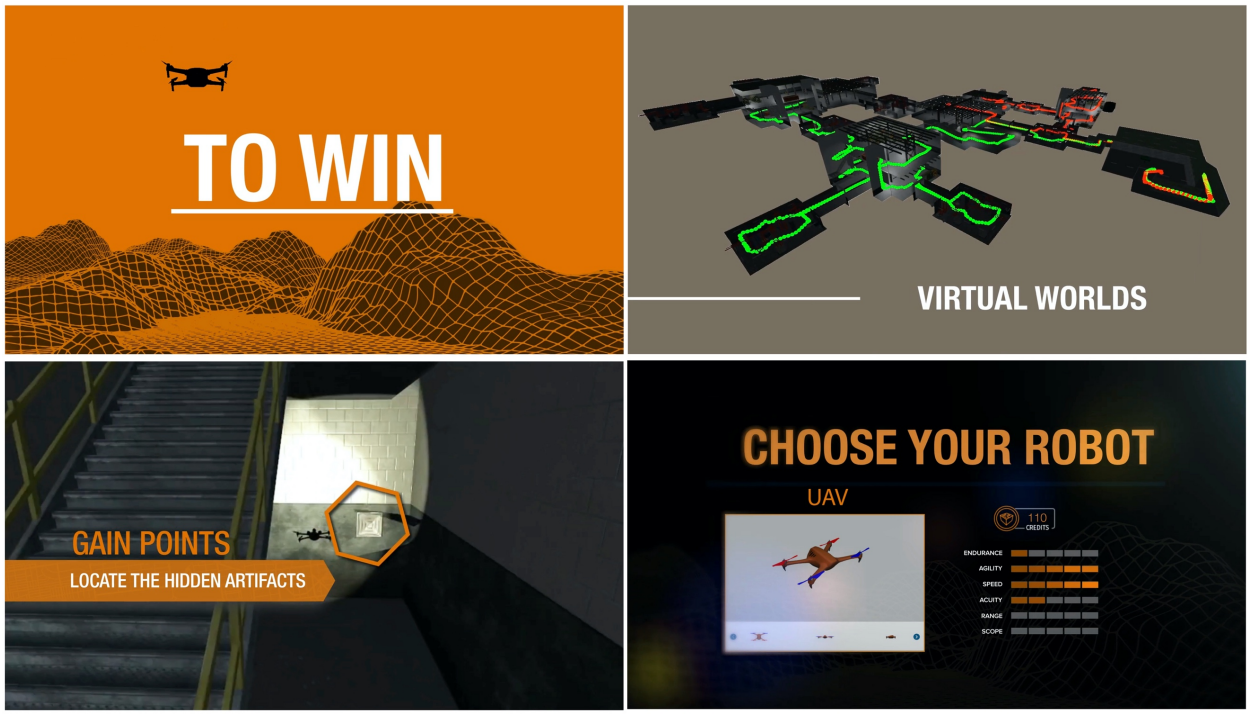


Fig. 4.9: Stills from the promotional video for DARPA's Subterranean (SubT) Challenge. https://www.youtube.com/watch?v=gSMiLLx8Y0Y. Screenshots by author.

And yet, while such speculative scenarios suggest how play can be exploited within totalizing control networks of incentivized flow, I argue that video games nonetheless offer a way for us to experience play in ways that don't immediately sediment into the political configuration of sovereignty. Here I follow more recent work in game studies that considers how video games—as aesthetic objects—have the capacity to convert play into a site of

experimentation that is not immediately predisposed by the procedural logics or technological systems of game media, or in the context of this argument, by the rhetorical processes of gamification. As Patrick Jagoda argues, "learning how to play but also think with games makes one more sensitive to nondeterministic potentials that inhere in each situation and each body at every moment. […] Gameplay is a virtual activity, then, insofar as it entails the generation of potential and dwelling within possibility spaces."[73] Following suit, I argue that border games might be able to experiment with play in order to invite players to contemplate how one's attitudes, preferences, and beliefs can or should be made available for modulation as a flow state within the procedural logics of state security.

Again, I return to *Papers, Please*. This time, though, I consider how the game employs failure to reveal gamification as an incomplete diagram of control through which players might improvise upon the play dynamics that sustain the expansion of state violence in digital and networked media. While processing entrants, players gradually discover that the game actually refuses any neat demarcation between success and failure within the scope of the narrative and mechanics. On the one hand, while citations might frustrate one's experience of flow, players inevitably realize that failing to correctly process a particular entrant can in fact reward one with extra credits or open up a new side quest. In addition, the game contains twenty different endings that are achievable depending on how one navigates the various extrinsic reward structures and narrative branches that appear in specific days. Through its multiple decision layers and game tree complexity, the game thus allows players to choose in what ways they might want to direct their experience of flow towards the normative coordinates of success and failure demanded by the state. In this case, play is not so much fixated upon reverse-engineering the logics of the

[73] Jagoda, *Experimental Games*, 29. On failure, see also Aubrey Anable, *Playing with Feelings: Video Games and Affect* (Minneapolis: University of Minneapolis Press, 2018).

game to discover the path to victory. And neither is failure, as some game studies scholars argue, predisposed to disrupting normative gaming logics, thus inviting players to "rehearse resistance and safely familiarize themselves with the cost and discomfort of critical resistance."[74] Rather, in *Papers, Please*, failure enables one to explore how gaming systems function, how they construct desire, and how they are imbricated within broader social, political, and economic processes.

Consider one more time the aforementioned moments where players are required to scan entrants' bodies to verify discrepancies according to heteropatriarchal frameworks of sex and gender alignment. As opposed to otherwise objective variables like passport numbers and expiration dates that are either correct or incorrect, the so-called rules for gender aren't so straightforward. While gameplay demands that gender prescribe to the binary logics of border protocol (i.e. it's either secure or threatening), players inevitably bring with them their own cultural, political, and social assumptions regarding gender politics that potentially exceed the game's procedural models. In my own play experience, for example, I found that despite my best efforts to operationalize my play strategies to maintain a sense of flow (and thus inflict violence whenever possible as an avatar of state power), on numerous occasions I received a citation for not inspecting a passenger's gender against their identification documents. However, this was not so much because I neglected to scan certain pieces of information nor because I intentionally

[74] Kagen, "Glory to Trumpland!," 35. Kagen here draws from Souvik Mukherjee's notion of a "postcolonial playing back" upon the logics of imperial power, which in the case of border games, allows one to interrogate and refuse the equivalence between success and proper citizenship. Souvik Mukherjee, *Videogames and Postcolonialism*, 6. Such an argument is similar to Mary Flanagan's notion of "critical play," a mode of subversion that seeks to intervene or undermine the normative logics through which power plays out, as well as to experiment with new rules and expectations for social change. Critical play is thus a tool or stratagem that works against power to create new forms of individual and collective being. Mary Flanagan *Critical Play: Radical Game Design* (Cambridge: MIT Press, 2009). Queer game studies scholars similarly note how failure might resemble a kind of disruptive force that exposes the ideological limits of success built into gaming mechanics, systems, and conventions. Drawing upon theories of queer failure, Bo Ruberg for example suggests that failure can illuminate a "transformative mode of play" that not only "defies normative notions of desire and success," but also performs "a mode of resistance against a game's heteronormative systems of value." Bo Ruberg, *Video Games Have Always Been Queer* (New York: NYU Press, 2019), 135-137.

wanted to sabotage state security, but rather because I didn't immediately perceive there to be discrepancy in the first place; perhaps I overestimated the possibility that the game would embolden trans and gender non-conforming migrants, even if I very well knew that they wouldn't.

By narrating my own play experience, I don't intend to moralize my relation to the game as if it is somehow enlightened, ethical, or responsible. Rather, I point to such moments because they foreground how players often outsize any particular play style imposed upon them. Through such modest failures, I began to consider to what extent flow is possible or even necessary in my play experience when working in service of border security and how I might begin to reconceptualize my relation to the state in order to reach any one of the multiple endings. In this way, the game foregrounds how the ubiquity effects of flow—in which play can solve any problem and benefit any individual who voluntary complies with procedural choice architectures—are not guaranteed, but rather produced through the continual negotiation of personal frameworks of social difference within the technical parameters of gamification systems. Ultimately, then, border games like *Papers, Please* open up flow as an affective process qualitatively different than those found in real-world gamified borders in which colonialist, technocapitalist, and imperial hegemonies are masked under some austere repertoire of formalized productivity. By encouraging players to navigate the pleasures, violences, and disappointments of border security through failure, video games restage flow as a site to experiment with the procedural models of state sovereignty that produce ubiquity effects. If speculative futures envision security worlds grounded in the universal appeal of play as interactive, voluntary, and fun, for now failure makes possible a transformed aesthetic encounter

with flow that reveals the affective fictions that animate our experiences of ubiquitous surveillance within gamification.

# CONCLUSION

## Worlds Still Living

*After Ubiquity* has explored how the concept of ubiquity both conceals and is enabled by the differential effects of visibility and violence that animate surveillance politics. Through a set of conceptual forms—improxibility, aorist, dispersion, and flow—it has shown how, on a technical and aesthetic level, surveillance systems produce ubiquity as an effect of mediation in ways that draw from and extend upon formations of gendered racialization central to capital and colonial regimes of power. Such forms occupy the space between current material realities of surveillance and aspirational claims of universality. They conceal the effects of surveillance on marginalized communities even as they make appeals to ideals like objectivity and neutrality. Importantly, this is neither to suggest that bias and discrimination are simply built into surveillance nor that all data-based technologies are inherently exploitative. Rather, by revealing ubiquity to be a medial effect, I contend that data-based systems like predictive policing, DNA phenotyping, through-the-wall sensors, and gamification consolidate the sociogenic processes of racial capitalism into their operation. There are perhaps other ways of designing and using data-based technologies that don't rely upon the technics of social difference that I have traced in this project. But at the moment, it appears as if such technologies, especially when used for surveillance, will invariably articulate their technical capabilities through schema of racial, gendered, and sexual alterity in anticipation of a future of total ubiquity.

So what then is there to do? If these legacies of power are sedimented within our digital technologies, how can we imagine futures for social justice? I concur here with information scientist Noopur Raval who writes that a decolonial approach to data science "might benefit from

formal tactical engagement with information infrastructure and attunement to non-human agents as increasingly contributing to moral and political decisions."[1] What this suggests is that relations of power are indelibly manifest within the design and operation of particular surveillance systems, and further that digital technologies are constitutive of social and political formations. As such, to launch a critique of surveillance must entail examining the technological dynamics that condition different imaginaries of ubiquity that organize the social. Indeed, merely repurposing technology might not be enough without interrogating the processes through which social difference becomes consolidated into technical form.

However, as much as ubiquity might be conceived as an effect of mediation that can be exploited for new modes of critique and possibly resistance, there is perhaps more to the story. Ubiquity describes an experience of surveillance that is contingent not only upon certain data-based processes, but also upon one's proximity to racial, class, and gendered privileges. Again, this is why surveillance—especially because it produces modes of being in relation to power—can be felt as a newly universal presence for some or ongoing targeted discrimination for others. But how might the medial effects of ubiquity change when we understand surveillance as a global process wherein social difference takes on multiple forms within disparate historically contingent sites of surveillance? Indeed, surveillance has long been a "global assemblage" that puts pressure on myopic narratives of national surveillance cultures.[2] Such is a historical fact about surveillance within broader networks of colonialism and imperialism as it is a reflection of

[1] Noopur Raval, "An Agenda for Decolonizing Data Science," *spheres: Journal for Digital Cultures* 5 (2019): 4.
[2] David Murakami Wood, "What is global surveillance? Towards a relational political economy of the global surveillant assemblage," *Geoforum* 49 (2013): 324. See also: David Lyon, "Globalizing Surveillance," *International Sociology* 19 (2004): 135–49; Elia Zuriek and Mark B. Salter, eds., *Global Surveillance and Policing: Borders, security, identity* (Devon, UK: Willan Publishing, 2005); David Murakami Wood, "The 'Surveillance Society': Questions of History, Place and Culture," *European Journal of Criminology* 6.2 (2009): 179-194; Armand Mattelart, *The Globalization of Surveillance: The Origin of the Securitarian Order* (Cambridge: Polity, 2010); Heynen and van der Meulen, eds. *Making Surveillance States*.

contemporary political, economic, technological, and cultural developments across the world which produce "ubiquity distributions" indexing the uneven dispersal of digital surveillance.[3] Such developments occur within a range of "socio-spatial levels" across the scalar elements of security and capital.[4] These include: the uneven circulation of mobile technologies and internet access; the exploitation of low-waged labor; the extraction of natural resources to power digital infrastructures; the heightened militarization of borders to prevent migration; the intensification of security regimes through police, military, and para-military organizations; the sale and use of weapons for armed conflict; the collation of transnational corporate datasets to predict user behaviors and facilitate marketing; the broadening of epidemiological monitoring in public places, especially since the onset of the COVID-19 pandemic; the scalar operation of logistical networks for the movement of goods and bodies; and so much more.

At the risk of effacing these global distributions of surveillance, in this project I have privileged a version of ubiquity that features primarily within the United States and—through techniques of policing, warfare, and border security—within transnational sites of colonial and imperial domination elsewhere. The goal of this approach was to consider how the medial effects of ubiquity are entrenched within certain frameworks of sensemaking that shape experiences of surveillance in the global North, jockeying between the mundane and spectacular, the inconvenient and obligatory, the dystopic and fantastic. Throughout, I have maintained that surveillance is ubiquitous because it is invariably tied to the development and proliferation of digital technologies that shape the normative bounds of white civil society. But, if ubiquity is grounded with in the technics of social difference, then it's also the case that the way ubiquity appears within different surveillance cultures is contingent upon local politics of social

[3] Fuller, "Foreword," xix.
[4] Murakami Wood, "The 'Surveillance Society,'" 179-194.

difference that animate the design and use of these technologies. How then might we begin to address how the concept of ubiquity traffics across global and transnational surveillance cultures? And what different frameworks of resistance become legible when we shift attention beyond the surveillance cultures of empire in the global North? Such questions, I argue, are not simply theoretical, but have significant implications for how we understand concepts like resistance that usually attend discussions of surveillance on both local and global scales. If surveillance is felt to be ubiquitous differently in distinct parts of the world, then attending to specific local imaginaries of ubiquity might point towards an alternative geopolitics of violence that underwrite digital technology. Such an approach might also encourage us—and by us, I mean those beneficiaries of surveillance in global North—to reconsider what resistance looks like, where it's located, and who imagines it.

To consider these questions, in these final pages I turn to the short music film *ZOMBIES* directed by the Congolese-Belgian artist Baloji, which reveals a version of ubiquity framed by the geopolitics of the global South. Importantly, I understand the South here not as a geographic marker, but, following Boaventura de Sousa Santos, as "a metaphor for the human suffering caused by capitalism and colonialism on the global level, as well as for the resistance to overcoming or minimising such suffering."[5] In this vein, I consider how *ZOMBIES* articulates ubiquity not simply as a medial effect that emerges from certain technological and aesthetic processes that underpin data-based surveillance systems. Rather, it reveals ubiquity to be a spatial dynamic that grafts onto the cartographies of violence left in the wake of colonial and imperial domination where surveillance is buoyed by a complex web of social life that unravels across the mundane, the material, and the embodied. Ultimately, by attending to these socio-

[5] Boaventura de Sousa Santos, "Epistemologies of the South and the future," *From the European South* 1 (2016): 18.

spatial dynamics within the global South, I argue that we might encounter a decolonial framework of surveillance that, following Payal Arora, "shift[s], temporarily, from the positionality of data-centrism and individualism of choice to that of local praxis that emanates from the history of power and resistance."[6] Such a framework involves both excavating the geopolitics of extraction and valuation that underpin global machinations of ubiquitous surveillance and attending to possibilities for resilience that center the epistemic practices of the South and its inhabitants.

Released in 2019, *ZOMBIES* is a fourteen-minute long music video set to three tracks from the artist's 2018 album *137 Avenue Kaniama*. A Belgian rapper and hip hop performer of Congolese origin, Baloji combines traditional African music like rumba, soukous, and bikutsi with Afro-American music and electronic instrumentation.[7] In *137 Avenue Kaniama*, he uses these influences to explore themes of migration, disconnection, and loss that chart his familial relationships and personal experiences of the African diaspora. Indeed, the title of the album is the address for the home of Baloji's estranged mother in the Katuba neighborhood of Lubumbashi, the second largest city of the Democratic Republic of Congo located in the country's southern-most region.[8] In *ZOMBIES*, Baloji continues to build upon themes of disconnection and loss through a series of music videos that portray the deleterious impact of mobile technologies on social relations that occur within surveillance culture. As the artist states

[6] Payal Arora, "General Data Protection Regulation—A Global Standard? Privacy Futures, Digital Activism, and Surveillance Cultures in the Global South," *Surveillance & Society* 17.5 (2019): 724. See also Payal Arora, "Decolonizing Privacy Studies." For an overview of various literatures involved in the "decolonial turn" in big data, see Nick Couldry and Ulises Ali Mejias, "The decolonial turn in data and technology research: what is at stake and where is it heading?," *Information, Communication & Society* (2021): DOI: 10.1080/1369118X.2021.1986102.
[7] "Baloji announces '137 Avenue Kaniama.'" *Bella Union*, n.d. https://bellaunion.com/2018/01/baloji-announces-137-avenue-kaniama.
[8] "Baloji announces '137 Avenue Kaniama.'"

in interviews, the zombies in question are those mindless digital media users that riddle the Congolese urban landscape.[9]

The film charts a surrealist journey across the capital city of Kinshasa. In the first major sequence, we find ourselves in a nightclub where patrons dance alone with selfie sticks and virtual reality headsets under multicolored strobe lights. Then, we are thrown into the middle of a street parade where a marching band surrounds individuals holding signs up in support of Papa Bolo, a fictional despotic politician. Throughout, lyrics from Baloji's songs underscore the sense of alienation and collective stupor brought on by digital technologies. For example, the nightclub scene is set to "Spotlight," a track in which Baloji laments a life pixelated in a "ubiquitous dream / in a megabyte mirage." Similarly, the track "Glossine"—named for the tsetse fly known to cause sleeping sickness—accompanies the parade, thus suggesting that the public, like those afflicted by the disease, has been turned into mindless sleepwalkers who give themselves over in "voluntary servitude" to corrupt political, economic, and religious rule.

Set to an instrumental version of the song "Ciel d'encre" (French for "ink sky"), the closing scene occurs in a landfill where we find a masked man leading a white horse over piles of detritus. As in other sites across Kinshasa, the landfill is a strange and uncanny landscape. The horse we notice is not real, but a costume worn by two people. They walk past by a dried water reservoir within which reclines a siren whose tail is made from trash. Two women in white tennis outfits watch from above, their faces covered by large umbrellas made of neon green wool. Then, a tracking shot of crushed bottles, crumbled cardboard, and shredded plastic bags on the floor of the landfill cuts to a shot of the masked man from behind carrying a dead body over

[9] In an interview, Baloji remarks that he wanted the film to reflect how mobile phone create a "self-imposed isolation." Marley Hansen, "Baloji: Zombies," *Nowness*, March 14, 2019, https://www.nowness.com/story/zombies-baloji.

his shoulder, identifiable as Papa Bolo from the parade. A large blotch of blood paints the corpse's white suite as its limbs gently sway below. A young child quickly dashes by, joining another to witness the procession at a safe distance. The masked figure eventually stops, leaning forward out of frame to place the body on the ground. As he rises, he reveals the word *ubiquity* printed on his shirt in stark black capital letters (fig. 5.1) A few moments later, he pulls out his phone, indifferent to the corpse which has now integrated with the detritus beneath. A texting bubble appears on screen. "I'm at Avenue Kaniama," he writes, "back where it all started" (fig. 5.2).


Fig. 5.1: In the penultimate shot from Baloji's short music film *ZOMBIES* (2019), a masked man wears a shirt with "UBIQUITY" printed on the back. Screenshot by author.

Fig. 5.2: In the final shot from Baloji's short music film *ZOMBIES* (2019), a masked man wears begins texting on his phone while a corpse lays on the ground nearby. The text bubbles serve as the credits for the film. Screenshot by author.

To what here does ubiquity refer? The appearance of the term is neither accidental nor a minor detail; as the man pauses to catch his breath, the camera lingers on the printed text for several seconds as it slightly swells and collapses within the outline of his shoulder blades. In effect, *ubiquity* seems to hang over the scene in a haze of ambiguity—maybe a warning, a clarion call, or an elegy. On the one hand, the term could refer to the proliferation of mobile and networked devices across social life in the Congo region. Such is Baloji's concern throughout the film, in which he tracks how mobile technologies produce feelings of self-alienation even as they purport to augment connection and communication from the margins of experience. In some ways, this is an issue specific to the African continent, where the sudden proliferation of mobile technologies since the turn of the twenty-first century has spawned a "budding mobile

surveillance society."[10] Here, as elsewhere, the apparent ubiquity of mobile phones has led to a massive increase in state and corporate monitoring of telecommunications by both local and foreign actants. This of course only compounds surveillant processes conducted through other digital technologies, like drones and DNA databases, as well as more traditional means of surveillance within African societies.[11] In Nigeria, for instance, informants and personal contacts provide on-the-ground information to police agencies who monitor the public's mobile phone communications in collaboration with American entities.[12] In this sense, the ubiquity at stake in *ZOMBIES* is not only the exponential surfeit of mobile devices that have saturated the Congolese public, but also the sociotechnical forms of monitoring that make the public visible to local, state, and transnational surveillance networks.

However, beyond these more immediate significations, the final scene gestures to another reading of ubiquity framed by the geopolitics of digital technologies within the African context. Here in the landfill, we encounter a myriad of economic, ecological, and political violences that spill out from transnational surveillance assemblages. West African nations of Ghana and Nigeria, for instance, have become major repositories for electronic equipment waste (e-waste)—ranging from television monitors, computer systems, and mobile devices—due to poor national environmental regulations and opportunistic international markets hoping to sell off

[10] Kevin Donovan and Aaron Martin, "The rise of African SIM registration: The emerging dynamics of regulatory change," *First Monday* 19.2 (2014), https://doi.org/10.5210/fm.v19i2.4351. While in the early years of the twenty-first century many African countries reported only ten percent usage of mobile phones, by 2013 The World Bank and African Development Bank reported that there were 650 million mobile users in Africa, surpassing the number in the United States or Europe at the time. Jocelyne Sambira, "Africa's mobile youth drive change," *Africa Renewal*, May 2013, https://www.un.org/africarenewal/magazine/may-2013/africa%E2%80%99s-mobile-youth-drive-change.
[11] Kevin Donovan, Philippe M. Frowd, and Aaron K. Martin, "Introduction: ASR Forum on Surveillance in Africa; Politics, Histories, Techniques," African Studies Review 59, no. 2 (2016): 31–37.
[12] Mirco Göpfert, "Surveillance in Niger: Gendarmes and the Problem of 'Seeing Things,'" *African Studies Review* 59.2 (2016), pp. 39-57.

broken equipment.[13] The result is a range of environmental hazards that wreak devastation upon ecological systems and the health of laborers and local inhabitants. Similar violences are observed in the Democratic Republic of the Congo where the extraction of cobalt, a precious resources for making lithium-ion batteries in consumer electronics, has instigated years of armed conflict, forced child labor, and death.[14] To this end, the final scene seems to evoke a version of ubiquity predicated upon the seemingly universal circuits of racial capitalism that have installed infrastructures of exploitation and dispossession across the African continent in order to power global networks of surveillance. All of this is consolidated in the figure of the mermaid who is credited in the film as "Tata wata Siren," invoking a masculine version of the African water spirit Mami Wata which symbolizes both health, wealth, and good fortune alongside the threat of destruction. Overlooking an emptied water basin, Tata wata Siren suggests here that the proliferation of digital technologies might indeed bring new economic gain into the African continent, but at the price of ecological devastation, rampant illness, and burgeoning civil conflict.[15]

Taken together, *ZOMBIES* casts into relief how global processes of surveillance produce novel cartographies of destruction in the global South as a necessary byproduct of logistical and infrastructural systems of trade, telecommunications, and labor. Following Achille Mbembe, we might consider how Baloji's film thus refracts ubiquity through a necropolitical framework that bears witness to how surveillance produces a panoply of "death-worlds" across the global South

[13] Jack Sullivan, "Trash or Treasure: Global Trade and the Accumulation of E-Waste in Lagos, Nigeria," *Africa Today* 61.1 (2014): 89-112.
[14] Amnesty International and Afrewatch, "'This is What We Die For': Human Rights Abuses in the Democratic Republic of the Congo Power the Global Trade in Cobalt," Amnesty International, 2016, https://www.amnesty.org/en/wp-content/uploads/2021/05/AFR6231832016ENGLISH.pdfl Kate Crawford, *Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence* (New Haven: Yale University Press, 2021), 34.
[15] Henry John Drewal, "Mami Wata: Arts for Water Spirits in Africa and Its Diasporas," *African Arts* 41.2 (2008): 60-83.

where power concretizes through the subjugation of life to death. Such death-worlds, Mbembe writes, are "new and unique forms of social existence in which vast populations are subjected to conditions of life conferring upon them the status of *living dead*."[16] According to anthropologist Filip De Boeck, nowhere is the necropolitical experience of the postcolony more palpable than in the Congo region, which since gaining independence from Belgium in 1960, has been marked by decades of war, poverty, hunger, and health crises like AIDS in the wake of colonial extraction and exploitation. As he documents, "the long and spectacular breakup of the Zairean state [1971-1997], combined with the spillover from conflicts along its borders, most notably in Rwanda, Uganda, and Angola, opened up spaces of death even further, and contributed to the banalization of the material and symbolic usages of violence and death invented in earlier periods of the (post)colonial state."[17] The result is that death has become "omnipresent" across Congo and specifically in Kinshasa, which is often colloquially referred to as a necropolis, or *cite cimetière*, in the local press.[18] Set within Kinshasa, *ZOMBIES* exhumes the necropolitical animus of ubiquity by diagnosing a new kind of death at the hands of a global surveillance machine. Here the living dead that Mbembe locates as the subject of the postcolony return in the image of Baloji's digital media user who, in becoming exposed to a process of "zombification," is both entranced and exploited by the technological circuits of a late modern militarized capitalism and colonial occupation.[19]

By tracing the necropolitical cartographies of surveillance in the Congo region, *ZOMBIES* transforms how we might conceive of ubiquity as an effect of mediation from the

[16] Achille Mbembe, "Necropolitics," trans. Libby Meintjes, *Public Culture* 15.1 (2003): 40, emphasis original. See also Achille Mbembe, *On the Postcolony* (Berkeley: University of California Press, 2001).
[17] Filip De Boeck, "The Apocalyptic Interlude: Revealing Death in Kinshasa," *African Studies Review* 48.2 (2005): 15.
[18] De Boeck, "The Apocalyptic Interlude," 13; 16.
[19] Achille Mbembe, "Provisional Notes on the Postcolony," *Africa: Journal of the International African Institute* 62.1 (1992): 4.

vantage point of the global South. If, as I have argued throughout this dissertation, the experience of ubiquity is produced through the technological and aesthetic processes of surveillance systems, the film shows how such an outcome is nonetheless predicated upon a backdrop of geopolitical violences that occur under spatial formations global surveillance. This backdrop has been present throughout the chapters of this dissertation, for example, in the neighborhoods targeted by predictive policing software or the built environments turned inside-out by through-the-walls sensors. But in *ZOMBIES*, such violences no longer remain hidden or obscured by the ubiquitous pretenses of surveillance. Rather, they are coextensive with the medial effects though which surveillance conveys itself as universal and non-present. In the landfill of *ZOMBIES*, to feel surveillance as ubiquitous is to already be interred within the bloodied environments of the colonial present.

And yet, perhaps such a reading of ubiquity is a bit too totalizing, if not somewhat sensational. Curiously, despite the morbidity of its title, there is actually little death in *ZOMBIES*. While there might be signs of past death written within the Congolese landscape, the only moment of depicted violence is that of Papa Bolo in the concluding moment. Rather, much of the film portrays very ordinary scenes of daily life that go on despite, or parallel to, the oversaturation of mobile technologies in African society. Intercut within the primary sections for each music video are more subtle and unremarkable montages of sociality in the streets of Kinshasa. So too do we find moments of pleasure and creativity, perhaps reflecting how, in the words of Mbembe, the postcolony "opens up a space for enjoyment at the very moment it is making room for death."[20] In one particular sequence, we follow a young woman from the nightclub to a hair salon where she is chastised for arriving late to work. The camera then shifts to a patron who discusses contemporary hair styles as she pulls

[20] Mbembe, "Provisional Notes on the Postcolony," 14.

out her phone to take a selfie to post on Facebook. The patron then rises from her chair and begins to dance to the introductory beats of "Glossine." We follow her outside where we find a range of characters in brightly colored outfits made from non-conventional materials: straw, wigs, condoms, scrap metal, and bottle caps. Many of them face the camera directly, located squarely in the frame against the backdrop of a yellow building (fig. 5.3). They are as much confrontational as they are triumphant in their address to the camera, presenting their recycled attire as expressions of beauty that in some cases exceed traditional gender roles.


Fig. 5.3: In Baloji's *ZOMBIES* (2019), Kinshasa's residents present to the camera outfits made from materials like straw, hair, and condoms.

In this tableau of portraits (in which Baloji appears holding a giant pineapple made of sunflowers), we find a different version of life that subsists within and beyond the surplus imaginaries of a global surveillant assemblage. Thandi Loewenson notes as such in her review of *ZOMBIES*, suggesting how the dancers articulate "a new kind of politics which isn't part of any 'Africa rising' narrative," one that's "been there all along, mired in what some might mistake for

detritus and waste or—worse—dismiss as 'mere' fantasy."[21] Here the everyday material violences inaugurated by digital media are transmuted in the performative enactment of a lifeworld already present within Kinshasa's living dead. In this way, *ZOMBIES* begins to sketch out a decolonial framework of resistance that unsettles the power dynamics of ubiquitous surveillance. Importantly, though, such resistance is not concerned with romanticizing the South as an essential site of opposition. Rather, the film considers how historical legacies of colonial and imperial domination have produced conflicting dynamics of empowerment and oppression on the local scale that are met with strategic forms of creative insurgency.

In exploring the dynamics of ubiquity within *ZOMBIES* in light of a decolonial framework of surveillance, I have tracked how global surveillance systems fashion new cartographies of violence across regions of the global South, but also how such death-worlds can be refused, reappropriated, or simply endured. And yet, despite my reading of the film, it is not my goal in this conclusion to offer a politics of resistance that might engender possibilities for justice and liberation. For some readers, this might be a surprising claim. Indeed, it has become commonplace among literature on surveillance—and even especially within humanistic fields like digital media studies, communication studies, or cultural studies—to end on a note of defiance against broader systems of power. In surveillance studies, especially, resistance has been long been the object of desire through which scholars attempt to outline methods for critiquing and disrupting contemporary developments in monitoring and control within security cultures. More recently, many scholars, following Martinican poet and philosopher Édouard Glissant, have turned to the concept of "opacity" as a way to think beyond oppositional logics of

[21] Thandi Loewenson, "Daring to Dream with Eyes Wide Open: review of Baloji's Zombies," *Review of African Political Economy*, June 7, 2019, https://roape.net/2019/06/07/daring-to-dream-with-eyes-wide-open-review-of-balojis-zombies.

invisibility or privacy, instead insisting upon "securing spaces for collective existence without being categorized and sots, without being atomized and diminished."[22] Opacity here opens up alternative ways to think with and beyond the injunction to transparency that would force individuals to become legible in dominant systems of commensurability and valuation proper to a model of ubiquitous surveillance.

While in support of these studies, I take seriously here the conceit that resistance is not a thought experiment or a theoretical exploit that can be conjured up in an academic monograph. Nor does it remain consistent or stable enough to track in real-time. Following *ZOMBIES*, resistance is material, embodied, and already happening in the world. It is practiced again and again by a range of radical anti-racist, anti-imperialist, and decolonial grassroots collectives that seek justice for indigenous, queer/trans, disabled, undocumented, unsheltered, and poor persons subject to the violences of surveillance. Importantly, many of these collectives interrogate the political and ethical dynamics of digital technologies like facial recognition and predictive policing as they are used to collect data and target marginalized communities. Ruha Benjamin tracks a number of such US-based abolitionist projects in her book *Race After Technology*, such as the StopLAPD Spying Coalition, the Detroit Digital Justice Coalition, and Data for Black Lives.[23] Many other protest movements too, like Idle No More consisting of indigenous peoples

[22] Monahan, *Crisis Vision*, 146. See also Zach Blas, "Opacities: An Introduction." *Camera Obscura* 92 31.2 (2016): 151-153; Keeling, *Queer Times, Black Futures*.

[23] Benjamin, *Race After Technology*. Importantly, for many organizations of data justice, technology must been understood within broader systems of power. For example, through their research on US-based data-driven policing practices like predictive policing software and fusion centers, the Stop LAPD Spying Coalition has created what they call the "algorithmic ecology," an abolitionist tool for analyzing algorithms across a complex web of ideological, institutional, operational, and community-based levels of surveillance. As they explain, "this model decenters the algorithm itself, looks at the different actors that shape the algorithm, and illustrates whose interests the algorithm serves, with the ultimate goal of dismantling the actors creating algorithmic harm." Importantly, the algorithmic ecology is a reminder that in order to interrogate how marginalized communities are violently impacted by these systems, one must go beyond technology-centered critiques of surveillance and instead attend to the relationships of power exerted across algorithmic actors. The Stop LAPD Spying Coalition and Free Radicals, "The Algorithmic Ecology: An Abolitionist Tool for Organizing Against Algorithms," *Medium*, March 2, 2020,

in Canada, seek to dismantle the institutions of carcerality and security that support capital and settler colonial regimes of governance.[24] Additionally, many data activist projects use algorithmic technologies in order to expose the violences of big data, such as the creation of national index of sexist violence in Argentina by #NiUnosMenos.[25] And finally, still numerous other forms of resistance to digital surveillance go unnoticed, including everyday practices of passing, forgery, and fugitivity. These "minor acts" exist on a lower register and give temporary form to coalitional networks of resilience and endurance under the necropolitical machinations of a global racial surveillance capitalism.[26] Throughout, resistance to data-based surveillance is shaped by ideals like access, participation, common ownership, and self-determination. They imagine futures for collective justice that are rooted in the abolitionist work of disenfranchised communities that seek to dismantle the vast networks of surveillance, incarceration, deportation, and extraction that shape contemporary global economies. And they rethink new possibilities for digital technologies through design justice principles that aim to increase healing and empowerment.[27]

While it is vital that we take these collective and individual methods of resistance seriously as sites of worldmaking and knowledge production, such an undertaking is beyond the scope of this present project. I leave the conceptual mapping of resistance to those involved in community-based efforts for abolition in local and transnational contexts. Rather, as a media

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https://stoplapdspying.medium.com/the-algorithmic-ecology-an-abolitionist-tool-for-organizing-against-algorithms-14fcbd0e64d0.

[24] Crosby and Monaghan, *Policing Indigenous Movements*.

[25] Jean-Marie Chenou and Carolina Cepeda-Másmela, "#NiUnaMenos: Data Activism From the Global South," *Television & New Media* 20.4 (2019): 396-411.

[26] Stanley, *Atmospheres of Violence*, 123. Anthropologist James Scott famously described such everyday actions of resistance as "weapons of the weak," which could involve practices like sabotage, evasion, false compliance, and feigned ignorance. James Scott, *Weapons of the Weak: Everyday Forms of Peasant Resistance* (New Haven: Yale University Press, 1985).

[27] Sasha Costanza-Chock, *Design Justice: Community-Led Practices to Build the Worlds We Need* (Cambridge: MIT Press, 2020).

studies scholar working within the United States, my ambition behind this project has been more modest. Rather than express an activist position against surveillance, I have aimed to occupy what Melody Jue defines as a "pre-activist role," one where "the slow careful work of academic writing" can show "how visual media and narratives work to challenge what we take for granted (if we produce them to create a broader public consciousness)."[28] In like manner, through close-readings of surveillance technologies, I have aimed to estrange that which we take for granted as an obvious fact of the world—that surveillance is ubiquitous. As I have demonstrated, what we understand to be ubiquity is in fact a contingent medial process conditioned by forms of violence, oppression, and dispossession that occur under global projects of racial capitalism and data colonialism. Surveillance, in short, is not ubiquitous because of technology; it is ubiquitous because of power.

If this writing is pre-activist, then I see *ZOMBIES* as an expression of a decolonial imagination of resistance that can gesture towards new aesthetic orientations to surveillance that push against the received frameworks of media studies. By attending to the geopolitics of digital media within a specific region of the global South, the film reimagines the stakes of ubiquity as an outcome of the very vectors of unequal distribution (of technologies, resources, capital) that shape surveillance cultures. In doing so, it dislocates ubiquity from the axes of universalism and non-presence that dominate contemporary understandings of digital surveillance and provincializes the very basis of ubiquity as a descriptor for surveillance: whatever medial effects of ubiquity become possible through the design and use of surveillance technologies must always be understood as an artifact of one's relation to broader systems of globalized racial capitalism. Ultimately, such a claim is perhaps most germane to the digital cultures of white supremacy in

[28] Melody Jue, *Deep Blue Media*, 166.

the global North where surveillance can be claimed to be newly pervasive through the deployment of sensing technologies, artificial intelligence, machine learning, and biometrics against those thought to be most secure. To recognize surveillance as ubiquitous is to thus become the ideal beneficiary of surveillance, one who lives in the ruins of the aspirational future of universalism that underpin corporate and state interests. By attending to how the medial effects of ubiquity emerge as an outcome one's proximity to racial, gendered, and classed privileges, we (scholars who research and teach digital technologies) might instead forge new language to unravel the violences of surveillance that can in turn inform on-the-ground practices for resilience. After ubiquity, worlds still living.

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