

The End of Genetic Privacy in the Blade Runner Canon

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Introduction

For nearly 40 years, Ridley Scott's *Blade Runner* (1982) has been a touchstone for commentators on the social implications of science and technology, particularly in the fields of robotics, cloning, and genetic engineering (Hamblin and O'Connell). As Scott's film attracted attention from critics and social commentators, it also prompted renewed interest in its source, Philip K. Dick's novel *Do Androids Dream of Electric Sheep?* (1968). In 2017, *Blade Runner* inspired a sequel, Denis Villeneuve's *Blade Runner 2049*. All three of these narratives draw on cultural references and scientific knowledge specific to their time, allowing us to explore each work's depiction of changing cultural norms concerning science. As one of the more recent entries into the "blade runner canon,"¹ Villeneuve's *Blade Runner 2049* reflects some of our present-day fears and anxieties back at us in terrifying relief. In response to the concurrent rise of biotechnology and authoritarianism, the film depicts a world in which protections of genetic privacy have collapsed in the face of a two-directional assault from powerful biotech corporations and an oppressive state. We will show how *Blade Runner 2049*'s narrative and *mise-en-scène* alert us to concerns about genetic privacy latent in both earlier works. Taken together, these three blade runner narratives suggest that, as the loss of genetic privacy becomes accepted and normalized, it opens the door to other privacy rights infringements, warning us of the danger of forfeiting individual autonomy to government and corporate entities.

The three blade runner narratives test privacy limits in painfully intrusive ways. One primary example is the use of the Voight-Kampff empathy test, an invasive procedure that measures physiological reactions to a series of emotionally provocative questions in order to distinguish androids (called Replicants in the films) from humans (Omry; Vint, "Speciesism"). Androids/Replicants, designed without the ability to feel emotion, typically betray themselves after only 10 to 20 questions. However, when androids/Replicants develop a sense of personal identity and operate outside of their standard protocol the Voight-Kampff test is no longer a reliable barometer of the distinction between them and humans. Human apathy also troubles this line, blurring the distinction even further. In the latest film, *Blade Runner 2049*, the Voight-Kampff test is still in use, but it has morphed from an occasional intrusion inflicted on Replicants suspected of rebellious tendencies to a routine procedure administered on a daily basis.

More extreme still, in the futuristic world of Villeneuve's film, creating genetic profiles has become standard practice. These profiles are registered at birth (or inception, in the case of Replicants), barcoded, and exhaustively linked to one's health data, personal activities, consumer behavior, and even memories. These data collection procedures are the common practice of both government entities, such as the LAPD, and private companies, such as the Wallace Corporation; this shared practice eventually sets up a showdown between government and corporate interests as both vie for control over the bodies and minds of the populace. *Blade Runner 2049* thus differs from its predecessors by depicting a society in which systematized databases of genetic information have become normalized, dramatizing the fears of some in the bioethics community, who have predicted that surrendering genetic privacy will also result in the loss of individual autonomy (Hallowell et al.; Hazel and Slobogin; Vayena).

The issue of genetic privacy has not previously been explored in criticism of any of the blade runner narratives. The current investigation offers a perspective on the evolution of the ways in which privacy and identity are violated in the blade runner canon. The progression of the canon mirrors real-world genetic and technological developments, potentially indicating a willingness today to sacrifice privacy, including genetic privacy, for social and emotional fulfillment. Our argument is particularly relevant to the interconnectivity of an individual's genetic data via direct-to-consumer genetic testing services, consumer behavior, and health records, dramatizing real-world developments that reflect the growing risks of encroachment on individual privacy rights so eerily dramatized in *Blade Runner 2049*.

Genetic Privacy

The historian Sarah Igo argues that privacy is an "elastic" term, which has evolved continuously over time. Until the late-nineteenth century, privacy was essentially non-existent as a "topic for widespread popular debate or as a common public language" (Igo 5). Today, of course, it has become one of the dominant concerns of civil society. In the nearly 150 years since prominent legal scholars Samuel Warren and Louis Brandeis first identified the need for a "right to privacy," concerns about the issue have shifted repeatedly, sometimes intensifying, at other times relaxing; sometimes focusing on government intrusion, as in the debates that raged around the creation of the Social Security number in the 1930s, and at other times focusing on corporations and the advertising industry (those "hidden persuaders" Vance Packard warned of in the 1950s); sometimes obsessing over the degradation of a culture addicted to social media and reality TV in the 1990s, and at other times worrying about ubiquitous surveillance and the power of big data in the twenty-first century (Igo 13).

Worries about genetic privacy have shifted in tandem with the larger social debates. In the 1930s, during a high point of the eugenics movement, knowledge of a heritable abnormality could put an individual or group at risk – in the Third Reich, such information could become a veritable death sentence. In the 1950s, with all the positive attention to the discovery of the double helix, genetics seemed to pose fewer risks, and there were fewer concerns about genetic privacy. Concurrently, Cold War fears of the atomic bomb left little room for public anxiety about genetics as a science, especially since mutation as a result of fallout was seen as a threat that genetics could detect. But by 1968, when Philip K. Dick published *Do Androids Dream of Electric Sheep?*, the potential of genetic screening and new reproductive technologies to grant parents unprecedented control over their reproductive choices brought new reasons for guarding one's genetic privacy. The ability to screen for undesirable traits – and to act on that information – put a premium on keeping one's procreative decisions to oneself. The sequencing of the human genome in 2003 changed the nature of genetic privacy decisively for our own time. Today, the widespread collection of genetic data has transformed the right to genetic privacy into a question of data management. Now bioethicists worry about the right of individuals to exercise control over the storage, repurposing, and display of information about their genome (E. W. Clayton; Naveed et al.). Who gets to see your data and what they can do with it are the dominant concerns of the "privacy policies" that one encounters at every turn (Hazel and Slobogin).

The blade runner narratives have frequently been invoked by literary scholars, film critics, and bioethicists for their insights into cultural attitudes toward genetics.² Moreover, the widespread influence of Ridley Scott's original *Blade Runner* movie on subsequent science fiction films makes its depiction of the social and ethical implications of genetics even more significant.³ Both the continuity and the changes over the years in

these three narratives reflect and illuminate the evolution in the concept of genetic privacy.

The numerous changes Ridley Scott's adaptation made to Philip K. Dick's novel have been canvassed by a number of critics (Cerqueira; Dienstag; Gravett; Kerman; Scott; Shetley and Ferguson). Villeneuve's recent sequel, *Blade Runner 2049*, was not tightly bound to the original plot, since the action took place 30 years after the setting of the first movie, but Villeneuve still had to ensure that new developments would offer a faithful extension of the earlier plots, themes, and characters in order to meet the expectations of an avid fan base. All three works focus on the economic, racial, and sexual exploitation of an underclass of genetically engineered clones (Bell et al.; Chan; Cerqueira; Dienstag; Gravett; Lev; Shetley and Ferguson; Williams). All three also underscore the powerful influence of corporate entities. Undergirding them all are the advances in technological and genetic engineering that have had profound repercussions for individual privacy rights in the futuristic universe of the story.

Do Androids Dream of Electric Sheep? (1968)

Because of *Blade Runner*'s iconic status, *Do Androids Dream of Electric Sheep?* may have become more famous as Scott's source text than as a work in its own right. The pull of Scott's vision exerts a kind of "backwards influence" on the novel, often overdetermining its cultural reception.⁴ In *Blade Runner* and *Blade Runner 2049*, the creation of a genetically engineered class of beings troubles the category of the human. However, while Dick does make clear that the androids who populate his novel are genetically engineered organic entities, the novel does not focus on genetic science nearly as much as the later films. This difference in focus has led critics to overlook the theme of genetic privacy in Dick's text. But genetics is inextricable from a major element in *Do Androids Dream of Electric Sheep?*, the eugenic policies that discriminate against a large portion of the population. The discrimination of humans toward androids has loomed so prominently in discussions of the novel that scarcely any attention has been given to the eugenic laws enacted against a third class of persons – the "specials" – who are also struggling for survival in his futuristic landscape. Dick's exploration of the invasiveness and cruelty of eugenics locates the genetically "defective" specials on a continuum with the genetic science depicted in the two later films.

In Dick's original version of the blade runner universe, nuclear fallout from the catastrophic World War Terminus has contaminated the planet, and the United Nations has begun encouraging mass emigration to off-world colonies to preserve humanity's genetic integrity. Production of personal android servants supports the off-world colonization effort. Although designed to be emotionless and subservient, certain of the androids begin rebelling against their constraints and developing interior lives.

The novel begins with a scene of marital discord between Rick Deckard, the main character, and his wife, Iran, in the privacy of their San Francisco apartment. As Rick and Iran snipe at one another, we begin to realize that, despite some of the familiar contours of their bickering, the source of their discontentment is quite foreign: they live with the constant existential stress and grief of surviving in a post-nuclear world. Rick, we learn, is a sort of bounty hunter working for the San Francisco Police Department. His job is to catch and eliminate androids who escape from the colonies and flee to Earth, where they attempt to pass as human. With advances in the production of androids, however, Rick's task has become more difficult. The latest line of androids, Nexus 6, is so sophisticated that there is cause to worry that the Voigt-Kampff test, the standard protocol used by the police to identify androids, may no longer be a reliable measure.

At once physically and psychologically invasive, the test requires asking subjects provocative questions and gauging their involuntary physical responses. In the novel, the instruments used to administer the Voight-Kampff test are a "flat adhesive disk with its trailing wires" attached to the subject's cheek and a "pencil-beam light" that shines into the subject's left eye. Rick says that the instruments measure "capillary dilation in the facial area" and "fluctuations of tension within the eye muscles" (44), both of which are autonomic responses over which the subject has no control. While such an examination represents an intrusion on the right to privacy of the humans who are forced to endure it, the test's implications for androids are far worse. For rebellious androids, the cost of failing the test is immediate "retirement," the euphemism humans employ to describe the killing of androids by officers of the law. The novel's action centers around Rick finding, properly identifying, and "retiring" six recently escaped Nexus 6 models who are busy blending in, quite successfully, among the citizens of San Francisco.

So far, other than the choice of San Francisco as the setting and the presence of a wife, the novel's plot will all sound quite familiar to fans of *Blade Runner*. However, the novel features a prominent character, arguably a second protagonist, who does not figure in Scott's film. Dick's third-person omniscient narrator floats between Rick's consciousness and that of another character: John Isidore, a man who bears the contemptible labels of "special" and "chickenhead." Isidore numbers among the people who have begun to experience genetic degradation due to exposure to nuclear waste. Because of their compromised genetics, the law deems specials ineligible to migrate off-world. Instead, they are condemned to slowly decline in physical and mental health while being scorned and shunned by the remaining "regulars" on Earth.

Dick lays this groundwork early in the novel when Rick reflects on the war's fallout:

The legacy of World War Terminus had diminished in potency; those who could not survive the dust had passed into oblivion years ago, and the dust, weaker now and confronting the strong survivors, only deranged minds and genetic properties. . . . The dust – undoubtedly – filtered in and at him, brought him daily, so long as he failed to emigrate, its little load of befouling filth. So far, medical checkups taken monthly confirmed him as a regular: a man who could reproduce within tolerances set by law. Any month, however, the exam by the San Francisco Police Department doctors could reveal otherwise. Continually, new specials came into existence, created out of regulars by the omnipresent dust. (8)

Note how the dust is an active subject in these sentences. It is an attenuated but still powerful enemy, actively threatening the wellbeing of those who remain within range of its contamination.⁵ In contrast with the menacing language Rick uses to describe the dust, his tone is blasé when he mentions the routine medical examinations he must undergo to determine his genetic "purity." Yet they, like the dust, pose a serious existential threat. Is it really the dust that creates specials out of regulars? The hierarchical distinction between regulars and specials and the consequences of falling into one category or another are entirely human inventions, imposed by the state. Rick projects agency, even menacing intent, onto the dust to avoid recognizing the danger contained within the human society of which he is part. The government, meanwhile, makes susceptibility to nuclear radiation into an individual failing: "The saying currently blabbed by posters, TV ads, and government junk mail, ran: 'Emigrate or degenerate!

The choice is yours!" (8). In other words, the responsibility for the abominable environment is placed on the dust itself or personal choice, but not the government.

The extent of the existential threat posed by the medical examinations Rick so casually references becomes clear when we meet Isidore. Living alone in a decrepit apartment building in a deserted suburb, Isidore ponders his status as human "kipple" (the term Dick coined for the detritus of human existence):

The U.N. had made it easy to emigrate, difficult if not impossible to stay. Loitering on Earth potentially meant finding oneself abruptly classed as biologically unacceptable, a menace to the pristine heredity of the race. Once pegged as special, a citizen, even if accepting sterilization, dropped out of history. He ceased, in effect, to be part of mankind. (16)

Phrases like "biologically unacceptable" and "pristine heredity of the race" are reminiscent of the language of the American eugenics movement. Further, Isidore's passing mention about "accepting sterilization" hints at a practice of government-mandated forced sterilization, raising the specter of the horrible crimes committed against the "unfit" by American eugenicists and sanctioned by the legal system. But worse still, to Isidore's mind, is that classification as a special entails a kind of social death. Isidore is now an abject being whose punishment for the all-too-human crime of frailty is the loss of his humanity. He must eek out an existence on the margins, tucked out of sight so as not to remind regulars about the tenuousness of their own humanity.

In Dick's futuristic world it is thus the existence of specials that supplies the justification for regularized invasions of genetic privacy carried out by the government against its citizens. Similarly, the policing of specials, not androids, is what provides the primary justification for oppressive and constant state surveillance. Early in the novel, Rick goes to the headquarters of the Rosen Corporation, the manufacturer of Nexus 6, with the intention of administering the Voigt-Kampff test to a blind sample of humans and androids to assess whether the test remains valid. Rachael, a Nexus 6 android so convincingly human-like that Rick at first fails to correctly classify her, remarks, "You can give that damn Voigt-Kampff test because of the specials; they have to be tested for constantly, and while the government was doing that you police agencies slipped the Voigt-Kampff through" (50). A few moments later, she adds that she rarely leaves the Rosen Corporation "because of those roadblocks you police set up, those flying wedge spot checks to pick up unclassified specials" (50). The systematized invasions of humans' privacy by the state and the continually lurking threat of social death via designation as a special are what made the Voigt-Kampff test possible. Its invasiveness and potentially murderous consequences seem only natural, even minor, in light of the intrusions and the dire consequences that humans were already willing to tolerate among themselves.

Tellingly, as pointed out by Adam Pottle in the only source that we found discussing eugenics in *Do Androids Dream of Electric Sheep?*, the name Dick gave the test, Voigt-Kampff, sounds an awful lot like actual tests developed and administered by eugenicists:

As evidenced by the following list, the tests often went to invasive and ridiculous lengths as they attempted to measure abstract qualities: the M-F (Male-Female) test, the Willoughby Emotional Maturity Scale, the Humm-Wadsworth Temperament Scale, the Kent-Rosanoff (free association) Test, the Bernreuter Personality Inventory, the Neymann-Kohlstedt Scale for

introversion-extroversion, the A-S Reaction Study for ascendance-submission and the Rorschach Inkblot. (Pottle, para. 14)

The fact that Dick's discussion of eugenics in *Do Androids Dream of Electric Sheep?* has received so little attention in cultural criticism is perhaps symptomatic of a broader tendency to believe that we left eugenics decisively in the past. After the Holocaust made the movement's inevitable trajectory toward racial cleansing and genocide impossible to ignore, there was much anxiety to play down or hide the extent to which American scientists and philanthropists had helped inspire and bankroll such atrocity. We comfort ourselves that the science we now practice is wholly divorced from this chilling history. However, eugenics never went away as a disturbing legacy in science fiction. Dick offers a critique of our eugenicist past in order to foreshadow problems that might beset the coming of genetic engineering.

While neither Scott nor Villeneuve elected to take up Dick's focus on eugenics, Dick's exploration of the theme intersects with his critique of capitalism in ways that offer interesting continuities with the films. When we first meet Isidore, he is "being yammered at by the television set in his living room as he shaved in the bathroom" (17). As Pottle observes, "The active subject of this sentence is not Isidore; it is the television. Isidore is the object, the person at whom the television is yammering" (para. 13). The characters inhabiting the world of the novel are continually targeted by invasive advertising; ads "blab" and tv sets "hawk," "yammer," and "shout," barging their way into homes and arresting the occupants' attention (8, 15, 17). The particular commercial blaring in the background during Isidore's introduction to the narrative is an ad for androids:

The TV set shouted, "– duplicates the halcyon days of the pre-Civil War Southern states! Either as body servants or tireless field hands, the custom-tailored humanoid robot – designed specifically for YOUR UNIQUE NEEDS, FOR YOU AND YOU ALONE – given to you on your arrival absolutely free, equipped fully, as specified by you before your departure from Earth; this loyal, trouble-free companion in the greatest, boldest adventure contrived by man in modern history will provide –" It continued on and on. (17)

In *Blade Runner 2049*, the interactive ads for Joi, a virtual assistant who takes the holographic form of a beautiful young woman, use similar language: "Whatever you want to see. Whatever you want to hear. Joi." These ads flatter consumers by pretending to recognize each individual's uniqueness, but actually they are conditioning all consuming subjects alike, teaching them to conceive a desire for the same product and to fuel the machinery of capitalism in the feckless pursuit of filling that void.

Isidore's passivity when faced with this onslaught is indicative of his status as a special, a fact of which he is painfully aware: "[T]he ads, directed at the remaining regulars, frightened him. They informed him in a countless procession of ways that he, a special, wasn't wanted" (20). Isidore knows he is not the "YOU" to whom the tv is calling out. The intrusive ads thus serve to constitute the normative subject; they are a lesson in ideology in the Althusserian sense, an implicit form of selection, priming subjects to recognize the eugenic hierarchy imposed by the state and reinforcing its appearance of naturalness and rightness. Although the theme of eugenics disappears from the films, both Scott and Villeneuve do follow Dick's lead in considering how invasions of genetic privacy and invasions of consumer privacy may find common

purpose. From the garish neon blimps in *Blade Runner* that continuously blare down at the citizens of Los Angeles advertising the benefits of living off-world to the interactive ads in *2049* that quite literally interpellate individual citizens in the streets, both films depict the invasiveness of capitalist social programming and interrogate how it often works in tandem with the hegemonic state.

***Blade Runner* (1982)**

The years between 1968 and 1982 witnessed important technological and genetic advances, such as the first recombinant DNA production in 1972, the first cloning of an animal's gene (a frog) in 1973, the first DNA sequencing in 1975, the founding of the first genetic engineering company (Genentech) in 1976, and the first transgenic mouse and fruit fly in 1981. Such revolutionary scientific innovations troubled bioethicists and the public alike (Nelkin and Lindee) and influenced the development of Scott's *Blade Runner*. In response to these advances in biotechnology, *Blade Runner* reflected a growing cultural concern about the ethics of profit-driven genetic research.

Set in 2019, the film probes the implications of the blurry line between humans and non-human by introducing genetically engineered Replicants. The Tyrell Corporation, the manufacturer of Replicants, advertises them as "more human than human," attesting to their entirely organic makeup (J. Clayton, "Frankenstein's Futurity") and their capacity for emotion. *Blade Runner* preserves the invasive Voight-Kampff test as a means of determining if an individual is human or Replicant but underplays the novel's eugenic emphasis on the difference between humans and "specials." As in the novel, police can stop anyone they wish and give the individual a Voight-Kampff test without a warrant. However, in the 1982 film, the Voight-Kampff empathy test has evolved such that it no longer requires physical interaction with the test subject. A mechanical arm extends from a box-like contraption, powered with gears, flumes, and pumps. The arm focuses on the iris of the subject, presumably measuring muscle response to emotionally provocative questions. A series of waves and graphs appear on the screen of the box. The lack of physical contact serves to distance the investigator from the test subject, and the translation of physiological responses to datapoints on a screen further depersonalizes the entire process.

The film opens with an iconic night-time flyover shot of decaying Los Angeles, the darkness of the sky periodically punctuated by explosions from toxic waste. The camera slowly zooms in on two structures that tower over the ruined landscape: the massive twin pyramids of the Tyrell Corporation. With this shot, Scott clues viewers into the power dynamic the film will explore and critique: America now worships at the feet of this biotech giant. Within the walls of the Tyrell Corporation, the first scene then unfolds. In a sterile office cubicle with cold light probing through the window, a rather smug blade runner impassively smokes while preparing to administer the Voight-Kampff test to a suspected Replicant named Leon. Leon enters in the standard-issue garb of a prisoner, patient, or custodial worker. As he begins to respond to the blade runner's questions, the film overlays the dialogue track with the sound of a pounding heart, alerting the audience to Leon's heightened emotional state. This soundtrack together with the closeups of Leon's iris and dilated pupil convey his terrified exposure and vulnerability. With these cues, Scott aligns viewers' sympathies with the suspected Replicant rather than with the phlegmatic human investigator. When Leon suddenly bursts out of his chair and shoots the blade runner in the chest, it startles the viewer but seems an excusable measure to escape the prying threat of the procedure.

The other scene in which a Voigt-Kampff test takes place is one of the few scenes that Scott adapted from the novel fairly faithfully. Deckard goes to the Tyrell

Corporation to administer the test to Rachael, who is, unbeknownst to Deckard, one of the new advanced models of Replicant. The setting is a cavernous, column-lined chamber situated high up in one of the pyramids. The room is lit by the warm rays of the setting sun filtering in through a broad window, a welcome relief after all the dark, sodden city streets illuminated only by a perpetual neon haze. An artificial owl presides over the space, watching the proceedings with impartiality from its perch, like the familiar of some hoary god (J. Clayton, "Concealed Circuits"). Gentle chimes sound soothingly in the background. The overall effect is of a grand temple, a far cry from the antiseptic laboratory we might imagine as the seat of biotech. Tyrell's message with the design of his headquarters is clear: he is not just a scientist and entrepreneur – he has become a modern-day deity, possessing the power to create life.

While Rachael sits for the test, one of her striking green eyes magnified to Deckard's view, Tyrell watches with detached amusement, his large, thick glasses reflecting the light and obscuring his own eyes. As she is at her most vulnerable, risking exposure to a man whose job it is to hunt and kill her kind, he stands by, confident in his own invulnerability. He is willing to sacrifice Rachael for the sake of an experiment, just to prove the superiority of his products and the preeminence of his talents. (Fittingly, Tyrell meets his bloody comeuppance when Roy Batty (Rutger Hauer), the cleverest and strongest of the escaped Replicants, exacts revenge for the physical vulnerabilities with which Tyrell's design has saddled him by gouging out the eyes of his "maker.") With its portrayal of the ego-driven, unfeeling Tyrell, the film asks: do we really want to entrust humans with the power of gods?

This scene also betrays the Voigt Kampff test's inherent weakness: despite the technological developments that place the interrogator at a physical remove from the subject, the procedure is nevertheless terribly intimate precisely because it exposes to view the inner workings of the subject's psyche. Asking Rachael charged questions in the strangely dreamy setting of the Tyrell Corporation, Deckard has to fight his own attraction to her. Although he harshly refers to her as "it" when the test reveals her to be a Replicant, he is clearly compelled by her, Replicant or not. Indeed, in Villeneuve's 2017 sequel, an aging Deckard confesses that he fell in love with her then and there.

Beyond administering the Voigt-Kampff test, Deckard's job as a reluctant instrument of the state requires him to trespass on individuals' privacy in other ways as well. We witness him freely rifling through Leon's belongings without a warrant, reflecting the culture's lack of respect for personal space. Most damning to privacy, particularly for Replicants or engineered animals, is a new form of identification through barcodes, first seen when Deckard identifies a genetically engineered snake scale found at Leon's apartment complex. In the novel, by contrast, there are "carbon sheets" that detail the androids' physical descriptions, home addresses, and work information, but individual models do not have a unique barcode engraved on their bodies.

Nor are Replicants the only ones to endure such encroachments on their private space. The relative domestic privacy that Deckard enjoys in the novel is lost in the 1982 film. In Scott's version of the blade runner universe, there is little room for tranquility, even within one's home. As famously embodied by Harrison Ford, Deckard is a surly, cocksure, disaffected bachelor who lives alone in a cramped apartment inside a sprawling urban complex. His messy bachelor pad is no refuge from teeming, seedy L.A., as signaled by the harsh sting of neon corporate signage creeping through his blinds and the constant blare of sirens in the background. The spotlights that probe through his windows demonstrate that there is no space deemed off limits to state surveillance. Although he is himself an extension of the government, Deckard still lives beneath its watchful eye. The film depicts a world where the autonomy of the

individual, both human and Replicant, is shrinking because of technological and genetic advances.

***Blade Runner 2049* (2017)**

As the blade runner canon evolves, violations of privacy become more extensive and invasive. Villeneuve's *Blade Runner 2049*, set 30 years after Scott's *Blade Runner*, retains much of the ideological structures and *mise-en-scène* of the 1982 film but depicts a society in which expanded privacy infringements have become normalized. Although Replicants and humans retain some sense of anonymity, the barriers to maintaining that anonymity have become greater. Human genetic information is stored in a DNA repository at the LAPD headquarters, a line that the 1982 film did not cross. Beyond the bureaucracy of the state, corporations have come to possess enormous databanks that contain integrated genetic data on both humans and Replicants, correlated with consumer data and other personal information. Furthermore, in *Blade Runner 2049*, barcoded data for Replicants is stored alongside massive "memory collections." Upon creation, each Replicant is now outfitted with a collection of curated false memories, taking personalized memory manipulation, first introduced with the fabricated memories of Rachael in the 1982 *Blade Runner*, to an entirely new level of intrusiveness. As a result, genetic privacy and individual autonomy have all but vanished for both human and Replicant in the 2017 film.

Blade Runner 2049 marks, cinematically, the application of the genetic and computational revolution over the last several decades, offering an eerie forecast of where trends in today's society may lead. The film brings into focus the significant real-world advances that occurred in genetics and big data in the years between 1982 and 2017. Between the release of *Blade Runner* and *Blade Runner 2049*, both computing power and genomic information evolved substantially: polymerase chain reaction (PCR) was invented in 1983; the Human Genome Project (HGP), which was designed to sequence all 3.2 billion letters of the human genome, was launched in 1990; a rough draft of the HGP was completed in 2000. As we entered the twenty-first century, advances in computational power included the inauguration of the International HapMap Project in 2003, which identified a majority of the conventional single nucleotide polymorphisms interrogated in a genome-wide association study, as well as projects in 2008 and 2010 that collected and compared human genomes on a larger scale (1000 Genome project and UK10K, respectively). The "All of Us Research Program," which is part of the Precision Medicine Initiative, is currently gathering genomic data from a million people living in the United States and linking those genomes to lifestyle, environment, and biology, to facilitate targeted approaches to delivering precision medicine (All of Us). Yet, as our knowledge and abilities have grown, so too have fears about the potential misuses and abuses to which unbridled access to such information could lead (Reardon).

Extrapolating from these advances, genetics and computational power underpin a number of genetic privacy threats portrayed in *Blade Runner 2049*. Villeneuve's story follows its protagonist, played by Ryan Gosling – Agent KD3.6-7 (typically abbreviated to a mere consonant, K) – as he questions the distinction between human and Replicant. K is a Replicant, one of the latest Nexus 9 models, who is also a blade runner working on behalf of the LAPD. On a routine mission, K discovers the remains of a female Replicant buried with surprising care and devotion beneath a tree. Based on a bone structure analysis conducted back at the LAPD headquarters, evidence emerges that this Replicant may have given birth to a child. In a visit to the headquarters of the Wallace Corporation, the new manufacturer of Replicants, K recruits Wallace's staff to

help identify the deceased Replicant from a hair sample. As K explores the DNA archives housed at the Wallace Corporation, he discovers that the hair belongs to Rachael, the Replicant with whom Deckard ran away at the conclusion of *Blade Runner*. K also searches the vast LAPD archives of human DNA and discovers genetic files for twins born on the date inscribed on the tree under which he found Rachael's body. Should it prove that a Replicant was indeed able to reproduce, this would shake the blade runner universe to its core, challenging the supposed distinction between humans and Replicants and thus compromising the basis for human dominion. For this reason, the state, as represented by the LAPD, is determined to destroy all evidence of the Replicant child's existence. However, the head of the Wallace Corporation, Niander Wallace, views Replicant reproduction not as a threat to the world order but as an opportunity to harness the biological imperative in order to generate even further profit and expand his own power. As Sherryl Vint remarks in her analysis of the film: "In its vision of synthetic, fleshy replicants and its fetish that they can become fertile, *Blade Runner 2049* makes visible a contemporary social fantasy of biology fully woven into capitalist production" ("Vitality," 16).

Even as the government and corporate databases are goldmines for K's work on his clandestine investigation, those same sources of information expose him to surveillance. The vast troves of personal data have compromised anonymity, making it a simple matter to track someone. We see the ease with which Luv, a Wallace Corporation employee, tracks and then attacks K by commanding drones using a Google-glasses-like device, all while having her nails done. This scene is in sharp contrast to scenes from *Blade Runner* where Deckard spends hours physically hunting or tailing Replicants – technology has certainly simplified surveillance.

The Voight-Kampff empathy test has evolved along with these other developments. Now referred to as baseline testing, the Voight-Kampff test has morphed from a sporadic and discretionary procedure to a standardized process that Replicants undergo regularly and systematically. In the film's second scene, K sits alone in a small, white cell and stares at a camera mounted on the wall. The screenplay includes a stage direction that states, "The CAMERA alters its focus accusingly. Locks in" (Fancher and Green). And, indeed, as the only other presence in the room besides K, the camera exudes hostility; it shows more personality and emotion than does K. A belligerent, disembodied voice begins to bombard K with provocative questions. Rather than responding to the content of the questions, he unerringly recites a series of fragmented and seemingly meaningless "baseline" phrases, drawn from Vladimir Nabokov's *Pale Fire* (1962): "blood-black nothingness began to spin / A system of cells interlinked within cells interlinked / Within one stem" (Nabokov 59). As Keren Omry observes: "In asserting 'cells interlinked within cells interlinked', the baseline test reminds the blade runner that he is *not* an ontologically distinct other that could serve as the subject of liberal humanization" (110). K's only hesitation during the procedure tellingly follows this line:

INTERVIEWER (O.S.): Do you dream about being interlinked? Interlinked.
A moment's hesitation. Then—
K: Interlinked. (Fancher and Green)

This almost imperceptible pause is our first hint that this particular android/Replicant does indeed dream, and he dreams of more than electric sheep – he dreams of human connection.

When the test is complete and K passes, demonstrating that he remains an (im)passive servant of the state, the disembodied voice patronizingly calls him "constant K." It's not a compliment – more like a belittling pat on the head bestowed upon an obedient dog. This new iteration of the Voight-Kampff test has successfully granted the interrogator access to the subject's emotional state while simultaneously keeping the interrogator at a great enough distance from which it is possible to completely dehumanize the subject. Using language that positions the film as a product of and response to the Trump era, K's boss, Lieutenant Joshi (Robin Wright), explains the state's justification for the ever-expanding scope of its surveillance apparatus: "The world's built on a wall that separates kind. Tell either side there's no wall – you bought a war – or a slaughter." She adds, "There's an order to things. . . . That's what we do here, we keep order" (Fancher and Green). However, the fact that baseline testing now has to be regularly administered is an implicit acknowledgement that it is possible for Replicants to develop the capacity for emotion and empathy. This hypervigilance serves as a tacit admission that the "wall" between humans and Replicants is indeed permeable. The "order" or hierarchy the government claims to be protecting is of its own invention, and thus the state's rationale for its overreach rests on circular logic that admits its own weakness.

Comfort is rare in the blade runner universe, as foreboding and paranoia are pervasive under the oppressive surveillance by both the state and corporations. In both *Blade Runner* and *Blade Runner 2049*, product advertisements probe through home windows, leaving little room for domestic privacy. However, the type of advertising has evolved between the two films. Rather than merely promoting brand recognition, the ads are designed to promote emotionally supportive devices that fulfill the human urge for intimacy and comfort. By purchasing such goods, individuals seek relief from their crushing existential dread. Perhaps the most important example of this form of consumer good is K's virtual female companion, Joi.

We are introduced to Joi when K returns home to his cheerless apartment, exhausted after his bloody fight to "retire" the Replicant guarding Rachael's body. Over the gentle crooning of Frank Sinatra in the background, a woman's voice greets him. In contrast to the hostile masculine voice that assailed him with questions during his baseline testing session, this voice is distinctly feminine, warm, furred with a pleasant accent. The voice and K engage in affectionate banter: she asks about his "meeting" (quite the euphemism for a murderous encounter), he offers to pour them both a drink to unwind, she apologizes for not yet having dinner on the table. It is a pantomime of the conventional conversation between a hard-working husband and his adoring wife. As though these cues aren't enough, when the holographic emanation of Joi first appears, she is clad in the garb of an idealized 1950s housewife: flowing skirt, tidy blouse, pearls, an apron tied neatly about her waist. Then, in the blink of an eye, her outfit shifts as she attempts to gauge K's mood and strike his fancy. She is the consummate devoted companion, morphing to meet his needs and desires, designed to alleviate his tension before the next "meeting" where he'll be expected to perform his brutal societal function. To celebrate their "anniversary," K presents her with what appears to be a jewelry box but actually contains a small device that Joi breathlessly labels an "emanator." It will allow K to carry Joi with him beyond the confines of his apartment. He will now be able to enjoy her loving attentions everywhere.

Even as products like Joi appear to offer intimacy and comfort, they are actually dangerously invasive for the consumer. The film begins to hint at the downside to Joi's constant companionship when K is browsing the DNA archive at the LAPD headquarters with Joi quite literally peering over his shoulder. She also references a

conversation K had with his commanding officer moments before, revealing that she has been listening in on all of his interactions. Her access to K and his investigation would pose no threat if she were truly his private companion, subject to binding privacy policies. But Joi is a creation of the Wallace Corporation, and the company uses products like her as tools to gain unprecedented access to consumers and their data. The Wallace Corporation harvests data from Joi, much as cellular companies do today.

When Luv, a Replicant working for Wallace, perceives at a glance K's dependence on Joi, she remarks with a superior smile, "I see that you are a customer. Are you satisfied with our product [i.e. Joi]?" (Villeneuve). We soon discover that Luv's smugness is justified; through Joi, Luv is able to track K over the course of his investigation, demonstrating the power of private consumer information. Hoping to track down the lost Replicant child, the corporation spies on the government by following K. The covert surveillance of official police investigations through a consumer product pushes the boundaries of privacy, both for the individual and the government-corporate relationship. The Wallace Corporation essentially outdoes the government at its own game; the state apparatus, designed to surveil private citizens, becomes itself the object of surveillance. In the world of the latest blade runner film, corporations thus reign supreme through their unbridled access to consumer data.

The interlinking of private personal information with consumer products and genetics paints a dismal view of personal privacy in the future. The film envisions an apocalyptic future in which individuals have exchanged their personal information for, on the one hand, the promise of safety and, on the other, the illusion of comfort. *Blade Runner 2049* hints at a dangerous feedback loop: as individuals give up more and more of their privacy rights in exchange for government protection, they turn more and more to products like Joi in a desperate bid to escape from the oppressive reality of their existence. Yet, such products, which draw upon troves of personal data to create feelings of intimacy, can in turn be used by government or corporate entities to further encroach on individuals' privacy.

Conclusion: Current trends in DNA databanks and the blade runner narratives

Today, the scientific community and the public are actively debating how to balance the benefits of data sharing with the need to protect the privacy of the individual (Malin and Goodman). The blade runner canon depicts one potential future, where the collection and mining of private information is done with little regard for individual privacy rights. The normalization and systemization of risks to individual data privacy in *Blade Runner 2049* mirror real-world social trends like the access that direct-to-consumer genetic testing services have to their customers' data (Allyse et al.; Gollust et al.; Laestadius et al.). The genetic genealogy industry is booming with more than 23 million people who have paid to have their DNA sequenced in pursuit of answers about their heritage and/or health. Genetic testing companies offer the allure of an enhanced sense of personal identity and familial interconnectivity; in offering such services, they have compiled vast DNA databanks. According to a recent *Science* article, 60% of Americans of Northern European descent – the primary group using direct-to-consumer genetic testing sites – can be identified whether or not they've availed themselves of one of these services and that within a few years, 90% of this population will be identifiable from the DNA available in genetic testing databanks (Erlich et al.; Greytak et al.). The increased systemization of genetic data use observed in the latest blade runner narrative is an analogy for – and warning about – recent trends in direct-to-consumer testing within the digital age.

Companies like 23andMe, Ancestry.com, and others are collecting millions of records of personal genetic data and storing them, creating treasure troves of valuable information ripe for exploitation, not just by commercial entities but also state actors. While 23andMe says that it is unlikely that DNA collected by their company would be used in legal proceedings, we have already seen other companies' databases leveraged to solve cold cases, most notably that of the Golden State Killer. A serial killer, rapist, and burglar who terrorized communities in California from 1974 to 1986, the Golden State Killer was only apprehended in 2018 after police were able to identify him using DNA that one of his relatives submitted to a popular genealogy website. The detectives' success in using a DNA databank to name Joseph James DeAngelo the Golden State Killer has inspired other investigators to reopen a series of cold cases and test their luck at the genetic database slot machine, particularly through GEDMatch. One company that specializes in these types of investigations says it finds matches in about 60% of the cases it pursues (Parabon).

While most people would agree that putting a serial killer behind bars is an acceptable tradeoff, questions are nevertheless growing about who should control the genetic data compiled by genetic testing companies and how that data should be used: Are we willing to give up our genetic information in exchange for more efficient law enforcement, health information, and consumer targeting practices? (Hazel and Slobogin). This question places private corporations in the driver's seat when it comes to crucial decisions that have immense repercussions for our cultural understanding of privacy.

The blade runner canon highlights the creeping acceptance of genetic privacy infringements and depicts the bleak outcomes in a society that has systemically abdicated genetic privacy rights. In particular, *Blade Runner 2049* envisions a crushingly lonely future in which individuals are willing to give up privacy to fill their emotional vacancies. As we stare into a future certain to test the bioethical boundaries of genetic privacy, the blade runner canon stands as a reflection of – and warning about – where we might be heading.

Notes

1. We use the term "blade runner canon" to encompass Scott's *Blade Runner*; the novel that Scott adapted, Dick's *Do Androids Dream of Electric Sheep?*; and the many creative contributions to science fiction that Scott's film has inspired, including novels, comics, video games, and films, among them Villeneuve's big-budget sequel, *Blade Runner 2049*.

2. Other works with a similar status for their respective time periods include: *Jurassic Park* (1990 novel; 1993 film), *Gattaca* (1997), the *MaddAddam* trilogy (2003-13), *Never Let Me Go* (2005 novel; 2010 film), *The Immortal Life of Henrietta Lacks* (2010 book; 2017 HBO film), and *Orphan Black* (2013-17 TV serial).

3. The representative character of *Blade Runner* is clear in the database assembled by our research team of over 700 films and television shows with significant genetics content. Science fiction was the largest genre in the database with 409 entries (Horror lagged far behind in second place at 84 films or TV episodes). Our researchers coded all the films and TV shows in the dataset for 109 unique attributes. In every case, the attributes found in the 1982 version of *Blade Runner* were among the most prominent features of other science fiction films.

4. We would like to thank the anonymous reviewer for the *Journal of Literature and Science* for suggesting this terminology and angle of investigation.

5. Compare the active, invasive agency of the nuclear "dust" in *Do Androids Dream of Electric Sheep?* with the invasive dust storms bearing viral contagion in Richard Matheson's science fiction novel from the same period, *I Am Legend* (1954). Elsewhere in this special issue, Feldman and Clayton discuss the invasiveness of the dust in Matheson's novel as an index of Cold War anxieties about external genetic threats rather than the internal threats inherent to genetic science depicted in the most recent adaptation of Matheson's story, Francis Lawrence's film, *I Am Legend* (2007), starring Will Smith.

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