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Drone Form and Techno-Futurities

Debjani Ganguly

Abstract: What does it mean for humanity to inhabit a techno-planetary system in which it is not central? This essay will address a facet of this question by exploring the aesthetics of drone warfare. The drone features in my reading as a metonym for a techno-human continuum in which the human as an autonomous subject with interiority and capacity for ethical action appears as eminently dispensable. Aesthetic forms not only are informed by but also shape a mode of perception by means of which we apprehend the world. What happens to such apprehension when both the mode of perception and subjecthood defy human-centered assumptions about aesthetic form? How does one novelize the scalar complexity of distributed vision beyond the human? When decisions about life and death are ceded to a machinic vision, do questions of moral agency and responsibility recede into a posthuman realm or do they gain even more urgency? The essay pivots around questions such as these.

Automated War and Inhuman Vision

IN 1972, AT A PUBLIC MEETING IN BOSTON of the antiwar Winter Soldier movement, an embittered Vietnam War veteran, Eric Herter, warned about new forms of war that would replace the struggle of infantry against guerilla bands in dense tropical forests. These wars, in Herter's words, "will not produce My Lais. It will be a war not of men at arms, but of computers and weapon systems against whole populations . . . the tortured bond of humanity between enemies at war will be eliminated."¹ Half a century later, unmanned automatic vehicles (UAVs) or drones have become the primary reconnaissance and weapons system of the world's largest military powers. Between 2004 and 2012, the use of armed drones around the world increased by 1,200 percent. Currently, more drone operators are trained in the US than pilots of fighter aircrafts and bombers. As distant killing machines that target enemies rendered virtual through an algorithmic logic of integrated cognitive systems, drones epitomize the culmination of automated warfare. Drone optics is simultaneously part of our everyday screen worlds and a posthu-

man instrument of sovereignty. It embodies a virtuality—in the mediatic sense of an information infrastructure—that is potentially catastrophic.

The elimination of the humanity of our species by self-operating technological systems has haunted apocalyptic imaginaries for centuries. Robot historians of the future are frequently portrayed as raconteurs of human diminishment. They perceive humans as little more than a group of industrious bees within a gigantic machinic phylum that is our technosphere.² Modern discourses on catastrophe overwhelmingly focus on the dangers of runaway technological advancement rather than the destruction of human life by natural disasters.³ In fact, since the nuclear era, the very idea of catastrophe, including our current climatic one, is perceived as technospheric, for there is no part of the planet that remains untouched by technology. Futuristic scenarios abound of techno-scientific experiments gone awry. Particle physicists assess the risk of large experiments with subatomic particles conducted by accelerators in terms of a catastrophic transformation of matter into “strangelets.” These are dense objects with high compression energy that could, through a process of contagion, unleash a phase transition of all matter into something utterly strange and “rip the fabric of space itself.”⁴ Nanotechnologists visualize nanometric omnivores—tiny molecular machines with a stupendous capacity to self-replicate. These, if not generated under extremely controlled experimental environments, have the potential to engulf the world and reduce the biosphere to what nanotechnologist Eric Drexler calls “grey goo.”⁵ Bioengineered viruses as agents of war and large-scale devastation routinely feature in all biosecurity risk-assessment exercises. Artificial Intelligence experts invoke the idea of singularity as an event horizon when machine intelligence might overtake human general intelligence. Each of these scenarios is saturated with a vision of human impotency and lack of control.

While terrifying in their implications, these scenarios are not merely products of a feverish apocalyptic imagination. They are prognostications based on a semblance of scientific probability and the proliferation of uncertain, but not impossible, futures. In the realm of culture, they shape a technic sensorium that oscillates between the phantasmatic and the dystopian. One can see them as proleptic epistemic exercises founded on the fact that humans now inhabit a world of quasiautonomous systems that have in this past century scaled to such proportions as to make them opaque to ordinary human comprehension and intervention. In his conception of the technosphere as an emergent system, the environmental scientist Peter Haff calls for an abandonment of the common assumption that it is human created and human controlled. Rather, as he puts it, “the workings of modern humanity are a product of a system

that operates beyond our control and that imposes its own requirements on human behavior. The technosphere is a system for which humans are essential, but, nonetheless, subordinate parts.”⁶

What does it mean for humanity to inhabit a techno-planetary system in which it is not central? This essay will address a facet of this question by exploring the techno-aesthetics of drone warfare. The drone features in my reading as a metonym for a techno-human continuum in which the human as an autonomous subject with interiority and capacity for ethical action appears as eminently dispensable. Ronald Arkin, one of the world’s foremost roboticists, has argued that robot warriors are “potentially capable of performing more ethically on the battlefield than are human soldiers . . . for they do not exhibit fear, anger, frustration, or revenge”: robot warriors can be programmed with great precision to respect the law, or in Arkin’s words, they can be equipped with “ethical governors” that will ensure that a war action is ethically permissible.⁷ The drone’s seductive affordances render the entire planet as the theatre of war while radically diminishing norms of human engagement in warfare. Humans enter the drone kill chain “only to be enchained as a particular kind of subject...drone humans are constituted in ways to make them resist calls on their humanity . . . they are called to conform to the drone.”⁸ This drone subject is frequently envisioned as a distributed intelligence virtualized across a composite technological spectrum consisting of data mining, satellite reconnaissance, and long-distance strikes. The digital eye now reigns supreme over a much larger terrain. As the twenty-four-hour eye-in-the-sky that has, in the words of one US military official, “revolutionized our ability to produce a constant stare against our enemy,” the drone has come to symbolize the terrifying power of surveillance, a kind of posthuman vision that simultaneously creates proximity to the violence it unleashes even as it allows a separation from the carnage.⁹

Aesthetic forms not only are informed by but also shape a mode of perception by means of which we apprehend the world. What happens to such apprehension when both the mode of perception and subjecthood defy human-centered assumptions about aesthetic form? How does one novelize the scalar complexity of distributed vision beyond the human? When decisions about life and death are ceded to a machinic vision, do questions of moral agency and responsibility recede into a posthuman realm, or do they gain even more urgency? This essay pivots around questions such as these.

Ever since the investigative reporter Jane Mayer broke the story about CIA’s covert drone war on Al Qaeda operatives in Pakistan and Yemen in 2007, the world has witnessed an outpouring of investigative journal-

ism, documentaries, literary works, and art activist projects.¹⁰ Literary works include George Brant's play *Grounded*, featuring the trauma of a female drone operator; Hari Kunzru's "Drones," a dystopic tale of a postliberal futuristic India populated by beings under the control of genetically enhanced Hindu fundamentalist oligarchs who use drones to control natural resources; Atef Abu Saif's *The Drone Eats with Me* (2014), a novelistic diary on drone warfare in Gaza; and Teju Cole's *Seven Short Stories About Drones* on Twitter. A recent crop of novels, while not solely focused on drone warfare, features drones as the inescapable sensory surround of our surveillant worlds. These include Nadeem Aslam's *The Golden Legend: A Novel* (2017), Sinan Antoon's *The Book of Collateral Damage* (2019), Namwali Serpell's *The Old Drift* (2019), Richard Clarke's novel *Sting of the Drone* (2014), and Daniel Suarez's *Kill Decision* (2012). This literary and novelistic corpus stages questions about posthuman subjectivity, machinic points of view, the proportionality of techno-war suffering, the crisis in the moral ethos that has guided war throughout human history, and the terror of automated warfare. In the sections that follow, I engage with an emerging vocabulary of critical thought that helps us grasp the machinic abstraction of human form through drone vision. Woven into my analysis are literary and artistic interventions that mine the aesthetics of optical derangement in drone cognition and explore the latter's technological assembling of the human as a form of life that can be annihilated at will.

The divine, the mythic, and the technic appear to mesh in conceptions of the drone's omniscience. "Using the all-seeing eye," writes a soldier, "you will find out who is important in a network, where they live, where they get their support from, where their friends are."¹¹ The drone in these descriptions is elevated to a realm that recalls theological conceptions of the sovereign as an entity that levitates above the body politic. From early modern times, sovereignty has been conceived as the summit of power: exceptional and with no equivalence. "Its name," writes Jean Luc Nancy, "is a *superlative*: literally what raises itself above from below, and what is no longer comparable or relative. It is no longer in relation, it is an *absolutum*."¹² The theological metaphor persists in conceptions of drone vision as weightless, vertical, and supreme. The term vertical mediation has frequently been used to capture drone operations.¹³ Unlike ordinary notions of mediation that refer primarily to our print and screen cultures, the idea of verticality refers to mediation across the entire spectrum from ground to sky. The drone is perceived as the epitome of vertical mediation. Vertical mediation through airpower radically changes the epistemology of the enemy, something that Carl Schmitt noted decades ago in *The Nomos of the Earth*. The enemy no longer occupies the

same ground as the just warrior. This leads to an absolutization of the idea of enmity as a force below that needs to be crushed. Writing about aerial warfare in the first half of the twentieth century, Schmitt observes: “Bombing pilots use their weapons against the population of an enemy country as vertically as St. George used his lance against the dragon.”¹⁴ Schmitt’s binary epistemology of absolute enmity athwart a vertical zone blends into the binary logic of the digital and the algorithmic in drone warfare. In the AfPak region—the borderlands between Afghanistan and Pakistan—all males above a particular age are considered military combatants irrespective of whether they have committed acts of aggression against the US.¹⁵ The division between civilians and soldiers breaks down completely. Thermal imagistic identification of all adult AfPak males from the drone camera makes targeting the “enemy” an act of vertical warfare unequivocal in its binary logic.

The drone’s Olympian vision and its power to inflict death from above can often be heady. “Sometimes I felt like a God hurling thunderbolts from afar,” reminisces one pilot about his experience of unleashing a Hellfire missile; “those about whom we make life-or-death decisions, as they scurry below or carry on as best as they can, have—like any beings faced with gods—no recourse or appeal,” notes a drone operator.¹⁶ The drone’s omniscience appears in monstrously mythic forms. The names given to US drone aircrafts—Reaper and Predator—and their surveillance technologies—ARGUS-IS and Gorgon Stare—draw on a repertoire of myths foretelling destruction and death. In Greek mythology, Argus Panoptes was a hundred-eyed giant. One of Argus’s tasks was to slay the fearsome monster Echidna, wife of Typhon, which he successfully completed. Panoptes literally means “the all-seeing one” and is the root word for panopticon. ARGUS-IS, named after this mythical all-seeing giant, is famously known as a powerful aerial surveillance system. With a 1.8 gigapixel camera, it provides exceptionally high-resolution images and is now routinely mounted on warrior drones. The developers describe it as the equivalent of having one hundred Predator drones surveilling a medium-sized city all at once. As for the gaze of the mythical Gorgon after whom the surveillance apparatus Gorgon Stare is named—this is none other than Medusa, whose gaze turns into stone those unfortunate enough to lock their eyes with hers. Death morphs under the gaze of the drone’s infrared camera. When somebody is killed, bodily motion stops and the temperature begins to drop. As its live thermal form recedes and slowly merges with the temperature of the ground surrounding it, the body loses contour and color, vanishing from the visual field. It turns into stone.

Technogenic Life Forms

In the era of drone wars, a deepening virtuality via robotic technology and algorithmic reasoning has overtaken the photographic aerial surveillance that marked wars in the analogue era. The drone camera is a posthuman perceptual aperture. Its visual yield consists of a machinic aggregation of data. This has deep implications for how we address the question of the “human” in drone warfare. The human emerges not just as subordinate to the automaton but as a machinic assemblage. In the context of drone wars, technogenic life forms can be understood as machinic abstractions of the organic human form that are exposed to surveillance, manipulation, or annihilation. The drone’s order of vision rests on five principles: round-the-clock surveillance, synoptic or totalized viewing of all entities in space, data fusion, preemptive detection of anomalies in algorithmic patterns, and comprehensive archival retention of data. Our contemporary media forms are not outside the drone realm. The same information and communication satellite technologies that power our smart phones, tablets, laptops, and televisual screens also constitute the drone’s visual infrastructure.

The new subject of the drone is a technogenic life form, one that is coextensive with the informatic realm of data extraction, algorithmic calculation, and machinic destruction. A vivid portrayal of such a subject can be found in Palestinian writer Atef Abu Saif’s novelistic memoir, *The Drone Eats with Me: A Gaza Diary*.¹⁷ This work not only documents the terrifying presence of drones in the daily life of residents, but it also notes that their terror stems substantially from the *visual relations* that result from this presence. It is quite typical for drones to strike after hovering above their targets for upward of twenty-four hours in a single flight or even for several days via multiple flights. “Whenever I walk through the city at night,” writes Atef Abu Saif in his diary entry from August 25, 2014, “I keep one eye firmly fixed on the sky. I know that at least one drone is always up there, hiding among the constellations” (*DE* 227). The date is significant. Saif’s account traces the 2014 Israeli invasion of Gaza that lasted fifty-one days. Drone strikes were the primary weapons of this war, killing more than two thousand Palestinians and injuring another eleven thousand. Saif’s work offers a graphic account of both the virtualization of war sites and the daily, persistent terror of its noisy surveillance. In an entry dated “Saturday, 12 July,” Saif writes, “the drone keeps us company all night long. Its whirring, whirring, whirring, whirring is incessant. . . . It hangs just a little way above our heads” (*DE* 31). In the same entry, we find his thoughts on the violence and violating intimacy of drone vision:

Our fates are all in the hands of a drone operator in a military base somewhere just over the Israeli border. The operator looks at Gaza the way an unruly boy looks at the screen of a video game. . . . this is how Gaza looks on the computer screen—a thousand images captured by a speeding drone and relayed back to a computer, perhaps a laptop on a desk. The images might include any detail. One of them could be of Hanna and me sitting on the blue sofa in our flat, staring into the darkness. Another might be of our children sleeping in the corridor, spied through the bathroom window at just the right angle. (*DE* 31)

The drone subject is machinic. As soon as it enters the sensor operator's virtual vision, it gets recoded as a potential target that can be eliminated by the press of a button. Yet in the target's inability to strike back at the enemy above, there is a strange derealization of violence, a fundamental nonreciprocity that violates most norms of military combat. One drone operator writes, "it's almost like watching an NFL game on TV with its tiny figures on the screen compared to being down there in the field in the mud and the blood in the rain."¹⁸ The drone's ubiquitous gaze penetrates and reconstitutes every gesture and act, every minute detail of the subject's life, including his dining habits:

The food is ready. I wake the children and bring them in. We all sit around five dishes: white cheese, hummus, orange jam, yellow cheese, and olives. Darkness eats with us. Fear and anxiety eat with us. The unknown eats with us. The F16 eats with us. The drone, and its operator somewhere out in Israel, eats with us. (*DE* 31-32)

This passage captures the penetrative power of drone vision in disrupting familial routines of comfort and nourishment in targeted zones. The narrator's immersion in daily rituals with his family is no longer insulated from the space and time of war. With drones, war has become not only perpetual but also intimate. The border between civilian and military spheres has completely collapsed even for drone operators. "You've just been on a combat mission and half an hour later your spouse is mad at you because you're late for soccer practice," writes one.¹⁹ The surreal juxtaposition of domestic intimacy with war extends to surveilling insurgents. Drone operators spend hours and days surveilling their targets and in the process, become intimately acquainted with the latter's daily lives.

Asymmetric warfare has realized its extreme logic. It has morphed into a mode of preemptive hunting, or what experts call *cyngetic* war. The enemy combatant becomes the hunted and war is reduced to an unheroic pursuit of prey. Rather than capture territories, this mode of war targets individuated bodies virtualized on a composite database called *kill boxes* or microcubes of death. The fleshly, blood-soaked terror

of war is transferred wholesale to the hunted. A rich conceptual vocabulary has emerged in recent years that helps us grasp the simultaneous enmeshment of the human in the technological and algorithmic circuits of drone warfare, as also the rapidly intensifying modes of virtualization that render the human as a form of life exposed to the threat of annihilation. This vocabulary includes idiomatic phrases such as “death by metadata,” “radiographic episteme,” “pattern of life,” and “kill box.” These expressions help us grasp the unique nature of aesthetic and ethical challenges involved in engaging with an entity that is simultaneously a media form, a data mining machine, and an instrument of war.

Death by Metadata: This phrase captures algorithm-driven fatalities enabled by the drone’s data extractive capabilities. Various referred to as a flying data miner or a digital vacuum cleaner, drones Hoover up vast amounts of data from various systems around the world, including energy grids, commercial aerial infrastructures, satellite technologies such as Google Earth and Global Positioning Systems, and telecommunication networks. Rather than tallying this electronic surveillance data with on-the-ground human intelligence to identify the right targets, drones conduct lethal strikes that frequently kill innocent civilians. Attacks have been authorized again and again based on mobile phone metadata, a phenomenon that Jeremy Scahill and Glenn Greenwald refer to as *death by metadata*.²⁰ The term refers to General Michael Hayden’s infamous words: “We kill people based on metadata.”²¹ The *modus operandi* appears straightforward—geolocating SIM cards and ordering lethal strikes. To avoid detection, Taliban insurgents in Afghanistan frequently distribute their SIM cards to their group members or to family members and friends, who, in turn, end up as targets of drone strikes. The randomness of these strikes is terrifying. “So, it basically is—the standard is: We can kill you if we don’t know your identity, but once we kill you, we want to figure out who we killed.”²²

In an effort to encourage critical reflection on *death by metadata*, web developer Josh Begley created an iPhone app in 2012 called Metadata+, which informs the user each time the US conducts a drone strike. The app is designed to raise global consciousness about the horrors of drone warfare. It allows its users to explore the coordinates of every drone strike. Begley describes his work in terms of an involuntary interruption, a reaching into the pockets of smartphone users in order to annoy them into drone consciousness.²³ Begley’s app was enabled by the groundwork laid by the artist-journalist James Bridle’s celebrated *Dronestagram* project—a digital installation that uses GPS technology to unveil the exact spatial coordinates of the drone attacks. These are then uploaded

on Instagram with detailed annotation capturing the nature and extent of the fatalities, including the rationale behind the drone strikes. Art historians and media scholars name this form of art parasitology—an approach that exploits and feeds on the very system it wants to unravel.

Commendable as Begley's and Bridle's projects are in awakening public consciousness about everyday media technologies that are integral to drone wars—in making us *see like drones*, as it were—their art installations do not exactly resolve the problem of opacity that inheres in the drone's media apparatus. "There is a recurrent pattern," writes Andrew Cockburn, "in which people become transfixed by what is on the screen, especially when the screen—with a resolution equal to the legal definition of blindness for drivers—is representing people and events thousands of miles and several continents away."²⁴ In fact, the interplay of opacity and transparency is the very hallmark of the drone's artificial vision. Converting abstract data into semiotic signs and visual targets involves a process of active translation. As Alexander Galloway notes, any data visualization is first and foremost a "visualization of the *conversion rules themselves*, and only secondarily a visualization of raw data."²⁵ In order for us to understand this process better, we turn to two other concepts—*radiographic episteme* and *pattern of life*—that shape the drone's data world and its catastrophic virtuality.

Radiographic episteme. One of the key target-detection technologies in drones is the infrared camera and sensor that captures electromagnetic radiation from bodies and objects. While the technological sophistication of infrared sensors determines to a considerable extent the accuracy of thermal imaging, environmental factors play a much larger role in determining the efficiency with which an object radiates thermal energy. A body or an object's emissivity is affected by factors such as humidity, wind, atmospheric temperature, and surface type. The term *radiographic episteme* in the context of drones captures the space-time spectrum and individuated targets that can be surveilled via knowledge obtained not just from electromagnetic waves as they interact with the atmosphere, but also the algorithmic conversion of such thermal information into a large data repository.²⁶

Infrared imagery turns all bodies into indistinct morphologies that look spectral. When viewed from the sky through a grainy video, annihilated targets look like crushed insects. In military slang, Predator drone operators refer to such kills as "bug splats." A strike that causes massive civilian casualties is called a "heavy bugspat."²⁷ In 2014, an artist collective in Pakistan, with the support of the Reprieve/Foundation for Fundamental Rights as well as village locals, printed a portrait of a

nameless Pakistani child on a giant banner and installed it in a field in the nation's Khyber Pakhtoonkhwa region. The installation was named #Notabugsplat. The field-size image of the girl's face looks the drone operator in the eye and challenges the insensitivity and detachment of the drone military apparatus.²⁸ We learn that the girl lost her parents and two younger siblings to a drone attack. The installation is a strong repudiation of the machinic gaze of the radiographic episteme that converts potential targets and scores of innocent people into insect-like creatures that can be crushed at will. The radiographic episteme is co-extensive with yet another, named *pattern of life*. If the former eschews nominal identity (based on race, gender, fingerprint, eye color) for thermal signatures, the latter eschews nominal identity for aggregate behavior patterns and activities over time. Both amplify the opacity of drone vision.

Pattern of Life: The question of security in militarized rhythm analysis depends on the ability to distinguish between normal and abnormal patterns of behavior. When applied to drone strikes, this logic hinges on the schematization of forms of socio-behavioral life through a fusion of link analysis and geospatial data. The aim is to generate a composite data set by tracing the everyday activities of the targeted individuals through their various social networks to establish a pattern of life and deviations from the pattern. Signature strikes, based as they are on voluminous quantitative data, are often unable to make qualitative distinctions between the meaning of one kind of group activity (a wedding) and another (an insurgent gathering). Wall and Monahan call this an actuarial form of surveillance. When applied to drone wars, such actuarial surveillance can take lethal form. Groups in Waziristan gathered for special occasions, such as weddings, funerals, and legitimate tribal community meetings, have been routinely targeted and killed. Ordinary people are scared to attend social gatherings, and many have stopped sending their children to schools. Burials and funerals are no longer attended by families and friends for fear of strikes.

The extent of civilian casualties caused by pattern of life analysis include death, severe injury, destruction of property and livelihood, and prolonged PTSD for survivors. Especially traumatic for child survivors is the sound of whirring drones that they can't seem to erase from their nightmares.

In Nadeem Aslam's novel *The Golden Legend*, a seven-year-old child, Billu, complains of "an unceasing high-pitched noise."²⁹ Billu walks around in prosthetic legs. He happened to step outside his home in Waziristan when a missile struck his father, an insurgent on the US kill

list. The attack also killed his grandmother. His mother, Aysha, survived for she was visiting a friend. In the aftermath, Aysha struggles to give Billu a semblance of normal life:

She went to the corner where his artificial legs stood and she brought them to him. . . . Before attaching each prosthetic she leaned forward and smelled the healed areas, for any possible odour of sickness.

....

He was seven years old but there were days when it seemed as though he had regressed, afraid of things he had not been afraid of before and seldom speaking above a whisper. (*GL* 66-77)

Billu morphs into a technogenic lifeform, psychically scarred by the whirring sound of a deadly aerial entrapment and physically bound by a prosthetic equipment. So does Aysha, whose reflections confer overwhelming agency to the drone in determining the direction of her life. Aysha's trauma is compounded by guilt, for she has wished her husband dead due to his abusive treatment. "During those last months she hated her husband, and the other men in the Waziristan house, was barely able to stand the sight of him . . . there was guilt in her at times, as though she had invited their deaths, *had willed the American drones to arrive overhead, carrying missiles in their claws*" (*GL* 83).

Anthropomorphism and Machinic Ethics

Aysha in Aslam's *The Golden Legend* anthropomorphizes the drone as a predatory bird-like instrument of retribution. The drone form shapes her world as a cleric's daughter and an insurgent's widow. It both fore-closes her future and offers her fleeting erotic freedom in her love for Lily, a Christian outcaste in a dominant Sunni community. Her brother-in-law, Shakeel, and her deceased husband are pejoratively called "the 'drone brothers'" by a group of mocking youth (*GL* 267). The drone's retributive politics shatters the narrative flow of Aslam's novel as it erupts spasmodically in the lives of the key characters: Massud, Nargis, Helen, Lily, and Imran.

The trauma of drone wars affects not just survivors but also pilots and sensor operators. They are technogenic lifeforms, too, interpellated by the drone's cognitive apparatus and sensorium. They become part of a remote-killing bureaucracy, as they begin to *see* like a drone.

New cognitive demands on drone operators hinge on the globally distributed intelligence and data extraction capabilities of the UAV military regime. The pilot doubles up as a highly trained information processor and hellfire missile striker from distances that span thousands of miles. The sensor operator toggles various streams of visual information flowing in at rapid speed and interprets this information in real time. The mission intelligence coordinator interfaces with various computer databases in remote locations, coordinates communication between various outposts, and ensures the smooth operation of the various mediating technologies in order to determine the exact parameters of a *kill box*—a micro zone primed for attack. Actuarial surveillance is probabilistic, and the responsibility for accurate targeting of the culpable falls increasingly on drone operators. Drone pilots are also expected to check the deadly fallout of their strikes and, unlike fighter pilots, can see in graphic close-up the destruction they wreak. Their schizoid lives toggle combat zones and domesticity—killing at night, buying groceries and running errands for the family during the day.

The trauma of drone operators has generated a substantial body of work by social and clinical psychologists on the dangers of robotic warfare. Artists and writers in turn have explored the anthropomorphic conundrum of creating works of art that render the robotic in human terms, as embodying a techno-sensorium of awe, terror, trauma, grief, and retribution. In 2015, George Brant's *Grounded*, a Broadway play, starring Anne Hathaway as a drone pilot made waves in the American theater world for its depiction of the technologically proximate intimacy of remote warfare and the terror of everyday surveillance. The blurring of military and civilian domains is a key message of the play; the same technologies that kill civilians in remote locations also surveil American citizens:

But there's always a camera right
J.C. Penney or Afghanistan
Everything is Witnessed.³⁰

Grounded is a monologue that draws the audience into a machinic vortex that conjures the single character (Pilot) initially as an embodiment of supersonic aerial conquest (she flies the F-16 bomber) and then as a drone pilot grounded in an airconditioned container in the Nevada desert. The cause of this fall is her feminine body that gives birth. The gendered rhetoric from manned aerial vehicles to the Unmanned Aerial Vehicle is one of shame. At the start, the Pilot revels in her F-16 encasement:

It's more than a suit
 It's the speed
 It's the G-force pressing you back as you tear the sky
 It's the ride
 My Tiger
 My gal who cradles me lifts me up.³¹

The Pilot's triumphalist and masculinist eye-in-the-sky machinic form is gradually shed as she rages not only against the limitations of her maternal body and its encasement by drone infrastructure, but also against the shame of killing pixelated humans with a joystick in the confines of a van. "It's about being in control," says Haydon [the play's director]. "She thinks she's flying the drone, but actually *the drone's flying her*" (emphasis added); "it's very hard to write a machine as a protagonist," observes playwright Brant.³²

A frequent refrain among commentators is the limitation of an art practice that purports to *see like a drone*.³³ How might such digital art decenter the lethal abstraction of drone vision? Can the artist's drone-eye view really critique such machinic vision? Who really is *not* paying attention to drone strikes? Surely not people in targeted zones, who are exposed daily to the drone's whirring above their heads? What is lost and gained when drone vision is funneled through the humanist and humanitarian gaze of the writer and the visual artist? Questions such as these go to the heart of recent debates about anthropomorphism in new materialist philosophy, which offers a vitalist reading of nonhuman matter and explores the entanglement of human, biological, and technological worlds.

Anthropomorphism is the attribution of human thought, emotion, and values to nonhuman entities. The latter typically gain agency only when animated by human consciousness. New materialist philosophy in the writings of Bruno Latour, Jane Bennett, and Karen Barad perceives the nonhuman world—animals and things; all organic and nonorganic matter—as already animated and active in the world. Latour replaces the idea of human agency with the term *actant*—the source and capacity for action that inheres in both human and nonhuman entities. The conventional idea of anthropomorphism, one that requires human cognition and consciousness to confer agency on the nonhuman world, is displaced in new materialist philosophy by the idea of distributive agency—a reciprocal acknowledgement that the agency of the nonhuman world has as much bearing, if not more, on the way our technoplanetary habitation has evolved over centuries. Karl Marx's dialectical materialism (old materialism) focused on human-generated economic structures, patterns and exchanges that determine the course of human

history. New materialism decenters the human and foregrounds a “turbulent, immanent field in which various and variable materialities collide, congeal, morph, evolve and disintegrate.”³⁴ Its philosophical horizon has been shaped in recent years by overwhelming environmental upheavals and technological advancement. Nature, machines, and humans are increasingly perceived as existing in a continuum, what Katherine Hayles calls a *cognitive assemblage*. Hayles’s idea of cognition extends to biological and machinic realms. To be human in such an assemblage is “to participate in the deep symbiotic relation between biological and technical cognizers.”³⁵ Hayles disaggregates cognition from both thinking and consciousness—the two attributes that celebrate human exceptionalism. Needless to say, she does not discount conscious thought, but her move enables her to formulate the idea of nonconscious (nonhuman) cognition: cognition disaggregated from higher order human thinking. As she puts it, “all lifeforms . . . possess the signal characteristics associated with cognition, namely flexibility, adaptability and evolvability.”³⁶ Rather than seeing the human-nonhuman cognitive spectrum as a dramatically novel phenomenon, Hayles asserts that it is inextricable from our evolutionary phylum. What has changed in our cognitive landscape is the technic sensorium due to the acceleration of machine intelligence.

What might we make of the anthropomorphic aesthetic of drone warfare in light of the above insights? There are at least three implications that might be worth reflecting on. First, we may need to interrogate a purely humanistic and humanitarian standpoint in opposition to the machinic, and reckon with the idea of an *embodied virtuality*, of new forms of subjectivity that are born out of the interface between bodies and computer technologies. “Maybe it is worth running the risks associated with anthropomorphizing,” writes Jane Bennett, “because it, oddly enough, works against anthropocentrism: a chord is struck between person and thing, and I am no longer above or outside a nonhuman ‘environment.’”³⁷ An example is a drone-centric excerpt from Teju Cole’s “small fates” Twitter poetry: “Call me Ishmael. I was a young man of military age. I was immolated at my wedding. My parents are inconsolable.”³⁸ We saw similar examples in what I have called technogenic life forms. The virtual has long been perceived as disembodied form: as an intangible real or a potential vessel for the actual and the concrete. A mathematical equation, a genetic code, an algorithm, and a digital simulation fit this understanding of the virtual. Information in first-order cybernetics of the 1940s was typically perceived in this disembodied or nonmaterialist sense. The increasing penetration of machine logic into human and nonhuman lives with the rise of social media, telemedicine, drone wars, and surveillance technologies urges us to conceive of virtual-

ity as embodied, as coextensive with the material and corporeal world. In this sense, seeing like a drone in works of creative art and literature is much more than replicating or animating the virtual apparatus of a Predator or a Reaper. A drone aesthetic in literary, theatrical, and cinematic works captures the gamut of humanitarian crisis unleashed by the drone's machinic logic from which the human body cannot be extricated. The Reaper drone's virtuality is catastrophic precisely because it is so bloodied.

Second, literary scholars and humanists may need to attend to the coevolution of the human and the machine in algorithmic reasoning, and not assume that human forms of deep reading are invariably subsumed by machine logic. The human-machine continuum yields new modes of reading and cognition that do not readily map onto the conventional understanding of human interpretation and machine learning as fundamentally opposed. Anthropomorphically speaking, in our age of digital acceleration it is not the human who comes prior to the machine in shaping the realm of meaning-making, nor does machine intelligence acquire agency solely through human cognition. Rather, the two interact in an algorithmic activity that is "performative . . . they learn, adapt, adjust and evolve their behavior according to a qualitative synthesis of vast quantities of data"; further, the algorithmic world is governed by abductive reasoning—a radical shift from the deductive mode applied to a small body of data to the "inductive retrieval and recombination of infinite data volumes."³⁹ The recursive and iterative nature of algorithmic calculation surpasses traditional cybernetic notions of control through feedback loops and also resists causal determinism. Broadly speaking, in the era of algorithms the divide frequently posited between an assumed techno-positivist logic of computation and the ethical [subjectivist] comportment of literary hermeneutics is becoming increasingly hard to sustain.⁴⁰

Not only does such critique not take into account the long materialist history of our discipline—based on manuscript technologies and the rise of the print medium—it also does not enable our field to adapt to the overwhelming digital surround of our contemporary age. Literature as an academic discipline naturalizes an idealized reader-subject whose history is only as recent as the early nineteenth century, when Romanticism burst on the scene with ideas of interiority and historical consciousness. But as the extensive writings of philosophers and systems theorists on technology, media form, and self-making have shown, individuals rarely acquire a sense of self through pure psychic interiority. Among other things, individuated meaning-making is often a function of form and medium generated by the technological affordances of each era. Further,

humanistic critiques of computation and algorithmic reason appear to cling to the idea of art and literature as sites of secular enchantment that need to be insulated from the banal corruption of industrial and instrumental logic.

Apart from the fact that algorithmic logic is not invariably instrumental and techno-deterministic, it is important to remember how recent this history of disaffection is. It is only since the Frankfurt School's interwar-era critique of instrumental reason (itself adapted from Max Weber) that some schools of literary theory have become biased against technology and quantification. This has less to do with preserving the sanctity of liberal individualism than with preserving a peculiar blend of Marxist and deconstructive continental theory that informs postwar literary studies especially in the US. Automatism (mechanized logic) and autonomy (free human action) are typically perceived as opposed, a luxury we can scarcely afford in our intensely techno-mediated age.⁴¹ Fear of science and technology during the Cold War era can also be attributed to the threat of nuclear catastrophe. The looming disaster of a technologically dominated world has haunted our discipline [and the humanities] since the nuclear era. Late medieval and early modern scholars have less of a problem tracing literature's tractions with science, technology, and material cultures. The relationship among science, technology, and literature has a complex history that needs to be urgently reprised for our times. Drone wars are a humanitarian scandal. Yet we can scarcely afford not to engage with its machinic forcefield that encompasses human will and subjectivity.

This leads me to my third observation about the attribution of responsibility and ethical action in automatized war. An ethical paradox inheres in the perceived techno-aesthetics of drone warfare. This aesthetic is often invoked in the language of precision and utmost technical perfection. It enables war strategists to conceive of drones as the ultimate humanitarian technology, one that not only causes minimum collateral damage but also protects combatants from injury and death. The term "humanitarian" in the context of drone warfare features with the same force it does in humanitarian law—a legal framework that seeks to minimize damage in warfare. Philosopher Bradley Jay Strawser is an ardent advocate of the inherent morality of drone warfare due to its neat precision. His extensive research tells him that the drone's elaborate infrastructure "*increases* a pilot's capacity to discriminate"; "the beauty of this seeker," he continues, "is that as the missile gets closer to the target, the picture gets clearer. . . . the video image sent from the seeker via the fiber-optic link appears larger in our gunner's display. And that makes it much easier to distinguish legitimate from non-legitimate targets."⁴² We have

seen how misplaced this confidence is when we confront humanitarian excesses due to the drone's algorithms gone awry. Further, the blurring of boundaries between combatants and noncombatants fundamentally violates the principle of just war. Nevertheless, in Bradley Strawser's view, "drones, for all their current and potential misuse, have the potential for tremendous moral improvement over the aerial bombardments of earlier eras."⁴³

The quest for a perfect automatized weapon was the spur for the invention of Teleautomaton—a mechanical prototype for drones—by Nikola Tesla more than a century ago. In his Teleautomaton patent application, Tesla argued that "the greatest value of my invention will result from its effect upon warfare and armaments, for by reason of its certain and unlimited destructiveness it will tend to bring about and maintain permanent peace among nations. (Patent No. 613,809, 8 November 1898)."⁴⁴ Notwithstanding the fact that Tesla's prophecy has not been borne out and there is no pacifist technological determinism built into any military technology, how might one calibrate ethical responsibility in technical cognitive systems? With regard to drones, there are a few emerging viewpoints. At one end lies the deeply humanist viewpoint of the military historian P. W. Singer, who avers that the responsibility for faulty drone operations in sites of conflict lies squarely with the generals and a handful of programmers, military intelligence analysts, sensor operators, and drone pilots. Ethical action cannot be attributed to machines. Deployment of war algorithms is the responsibility of human military personnel.⁴⁵ At the other end lies the posthuman machinic perspective of philosophers such as Strawser and Arkin. Arkin is an advocate of lethal autonomous robots. He argues that a nonhuman actant like a robot can be programmed to be a moral agent. Arkin does not support one-on-one replacement of human soldier with a robot, but recommends robots that can be programmed to follow a "bounded morality for very narrow tactical situations."⁴⁶ As the pace and pressure to make critical judgement calls from remote destinations accelerate, human errors abound. Robots can be programmed to make those split-second decisions with greater accuracy. Robots, Arkin notes, are also not burdened by the weight of human emotions in times of extreme stress such as "fear, anger, frustration, or revenge, and that ultimately (and the key word here is ultimately) behave in a more humane manner than even human beings in these harsh circumstances and severe duress. People have not evolved to function in these conditions, but robots can be engineered to function well in them."⁴⁷

Given our understanding of algorithmic reason as human-machine cognition, any view of ethical responsibility in drone warfare needs to

reckon with the limits of both the humanist vision of self-driven deliberative actors (invariably humans) and posthuman roboethics. Ethical deliberations in drone warfare increasingly draw on ideas of distributive agency and cognitive assemblage—actions across the human-nonhuman spectrum—that we discussed earlier. Individuated notions of free will and responsibility, the traditional ground of ethics, are no longer seen as adequate. Ceding ethical judgement to robots is also perceived as outright dangerous. The ethical vantage lies somewhere in between. “What perspectives,” asks Hayles, “offer frameworks robust enough to accommodate the exponentially expanding systems of technical cognitions and yet nuanced enough to capture their complex interactions with human cultural and social systems?”⁴⁸ Given the intractability of ethical war in the era of autonomous weapons, the UN Special Rapporteur on extrajudicial executions, Christof Heynes, has called for a moratorium on lethal autonomous robots (LAR). Machines, he argues, “lack morality and mortality, and as a result, should not have life and death powers over humans.”⁴⁹ The burden of drone ethics falls simultaneously on the humans who design these machines and the system’s recursivity—its ability to turn back on itself and emerge as a different human-machine assemblage based on its operational experience. Such a phenomenon is difficult to contemplate from the traditional humanistic perspective of technological exteriority, one that sees machinic systems as extrinsic to human will and consciousness. The challenge of designing an ethical framework that is intrinsic to a system is of a different order.

The diffraction of responsibility across multiple agents in a drone assemblage makes attribution of culpability extremely complicated. Little wonder, then, that many fictional works featuring drone wars obsess about the dangers of humans being eliminated from the kill-chain. Richard Clarke’s novel *Sting of the Drone* features a testy exchange about the role of human cognition between two characters, Sandra and Ray, both senior drone personnel in the US military establishment:

Ray was on a roll. “There are all sorts of legitimate concerns about our drone policy being counterproductive or precedent setting, but at root, for a lot of people, there is a subconscious fear of armed robots going crazy and killing humans.”

Sandra shook her head in a combination of disgust and disbelief. “Well, let me assure you that my drones do not have minds of their own. They are not going to all gain consciousness one day, like in *The Singularity*, and start flying themselves and picking on their own targets.”⁵⁰

Sting of the Drone is part of a creative genre known as insider fiction. Richard Clarke served as a counter-terrorism czar under three US Presidents. In this novel he draws on his experience as National Coordinator for Security and Counter-Terrorism under presidents Bill Clinton and G.W. Bush from 1998 to 2003. He was one of the early advocates for deploying predator drones against Al-Qaeda operatives after 9/11. The novel is replete with graphic bureaucratic details about drone warfare, but, more important, it explores a premise that members of the intelligence community have been mulling for years: what happens if the targets on the receiving end of a killer drone decide to strike back? This would lead to a breakdown of the immunity paradigm of drone warfare. Clarke's novel also anxiously ponders the posthuman horizon of fully automated warfare.

As a speculative coda, I turn to drone imaginaries shaped by a nonhuman swarm intelligence. My sources are a recent tract on swarms by US military strategist Paul Scharre and two literary works—Daniel Suarez's *Kill Decision* and Namwali Serpell's *The Old Drift*. In each of these works, drones revert to being imagined what they are in the insect world—creatures belonging to a swarm that display a collective intelligence unavailable to individual humans. The novels portray militarized robotic swarms alongside those that jam ecologically harmful infrastructures while offering mass vaccinations to a population infected by a virus. What might swarming portend for our technic futures?

Swarming: Drone Futures

The term “drone” has its origins in the insect world. It is the name of the male honeybee in a hive that has no responsibility except to impregnate the queen bee. A drone has no stingers and does not go foraging for food like the rest of the swarm. It is free to perform one task repetitively without distractions. It is not a stretch to imagine a fully automatized flight-machine being called a drone, one that performs certain repetitive tasks with superb efficiency. The behavior of insect and animal swarms has, in recent years, attracted the attention of military intelligence around the world. The goal in pursuing biomimetic prototypes of cognition appears to be informed by a desire to eliminate human vulnerabilities in wartime command-and-control structures. Humans have long been perceived as purveyors of noise and disturbance in cybernetic systems of information. The human is increasingly perceived as a weak link, and often as a lethal liability, in the accelerated decision cycle of automated warfare.⁵¹

Automated warfare crosses a stunning frontier in imagining drones as self-directed swarms. In 2014, Scharre remarked that the world would soon see a shift from fighting as a *network* to fighting as a *swarm*.⁵² Swarming eliminates not only individuated command-and-control processes but also any semblance of predictability about the attacking side's *modus operandi*. Algorithms interact autonomously with other algorithms in an escalating spiral of swarming behavior. In military language, swarming is the escalation of attacks on a target by several units operating simultaneously across multiple axes.⁵³ Drone swarms in particular have the potential to shape shift and move around in ways to confuse the adversary about the locus of threat. Their purpose is to "collapse [the] adversary's system into confusion and disorder by causing him to over and under react to activity that appears simultaneously menacing as well as ambiguous, chaotic or misleading."⁵⁴ The swarms are also self-healing in that they can reorient their collective intelligence to cope with what is called "companion loss"—the loss of a few hundred drones across a designated space-time continuum. Their epistemological topology is an *emergent* phenomenon that rapidly and incessantly adjusts to any changes in the environment without having to wait for signals from human commanders.⁵⁵

Military science appears to be in a race to have future wars shaped by the swarm. Roboticists in the United States have begun generating for DoD affiliates swarm prototypes that take the form of dragonflies, roboBees, houseflies, and other insects.⁵⁶ Researchers in Europe have recently generated prototypes of a distributed robotic system called "swarmanoids," or humanoid robotic swarms. These include three sets of coordinated robots specializing in heterogeneous functions. Collectively, they have the capacity to act in three-dimensional space. The eye-bots are tiny helicopters that can survey the environment and provide images from above; the hand-bots specialize in moving objects and climbing vertical surfaces; the foot-bots navigate rough terrain and transport both objects and the other bots at the ground level. The swarmanoid has the potential to be deployed for both military and peaceful purposes.⁵⁷ Defense establishments have yet to adopt drone swarms in battle. The year 2025 is frequently cited in projections for the use of humanoid robots in infantry combat roles.⁵⁸ Aerial swarms are likely to emerge much later, if at all.

As in the past, the fictional world is one step ahead. A fascinating, not to mention terrifying, narrative of military adaptation of insect swarming behavior is Daniel Suarez's novel *Kill Decision*. Linda McKinney, a professor of myrmecology in the United States, researches the collective intelligence of weaver ants, the most aggressive swarm on earth and one

of the few extirpator species along with humans. Based in Tanzania for her research, she contemplates with awe their forty-seven million years of existence that has survived ice ages and extinction-level events such as asteroid impacts. We see Linda developing a 3D computerized model of the weaver superorganism, tracking every single movement of a swarm on a single mango tree. The ultimate goal of her project is to develop a general model of Hymenoptera intelligence—intelligence attributed to insect swarms that are intensely social such as bees, ants, and wasps. Weaver ants are a eusocial species displaying not just the highest level of social organization among ants, but also the most fiercely territorial. They can “swarm enemies with suicidal disregard.”⁵⁹ Linda’s computerized swarm model becomes the target of cyber espionage. An arm of the US military intelligence locates her work on a fileserver in Shenyang, China. They keep track of an assassination attempt on her by a suicide drone that self-destructs after the attack. Miraculously saved by these intelligence officers, Linda is whisked off to an unknown location where the leader of the team, Odin, demands that she explain her model to his colleagues. They begin to see how the ants’ accrual of experience is determined by a pheromone matrix. The pheromone is a chemical that individual ants excrete as they move around so that the ants following them can trace a clear trail to food or any kind of threat. The matrix is akin to what artificial intelligence experts call a neural network. Swarm intelligence is generated by rapid data exchange. A parallel term in the insect world is *stigmergy*—a process in which individual parts of a swarm communicate indirectly by altering their immediate environment. Linda draws out the significance of these parallels for the team:

In fact, if I were going to create an autonomous drone—and I had no ethical constraints—swarming intelligence would be a logical choice. Lots of simple computational agents reacting to each other via stigmergic processes. That’s why weaver ants don’t need a large brain to solve complex puzzles. They can solve problems because they can afford to try every solution at random until they discover one that works. A creature with a single body can’t do that. A mistake could mean biological death. But the death of hundreds of workers to a colony numbering in the hundreds of thousands is irrelevant. In fact, the colony is the real organism, not the individual.⁶⁰

Linda is initially suspicious about the intentions of this intelligence group and is convinced that they want to help the military design swarm drones based on her models. Half way through the novel, the team is unexpectedly attacked by mysterious weaver drones and narrowly escapes annihilation. This is when Linda realizes that Odin is on a mission to track the creators of these drones. What follows is a thrilling espionage

and rescue mission that takes the team from rural Mexico to Pakistan and finally to the waters of the South China Sea. The drones come home to roost as Odin and his team discover that the hacking of Linda's model was done by private contractors within the US military-industrial complex who were looking to build and distribute swarm drones on a terrifying scale. The reader learns that a multi-billion-dollar autonomous drone bill was being fast tracked through the Congress even as Odin's team made these discoveries.

In the second half of the novel, we see Odin go on a crusade to build an international legal framework that would curb the proliferation of legal autonomous robots (LARS). The stakes are nothing less than the future of the human species and of the planet itself. Linda displays a planetary ethics that touches a deep chord in Odin. Her insights tap into our evolutionary phylum as mammals:

"If machines based on insect intelligence are widely used in warfare," [Linda tells him], "it could remove evolutionary safeguards that have been in place for millions of years. Among the creatures on earth only certain species of ants engage in unrestrained slaughter."

"What about the Holocaust? or Hiroshima?" [asks Odin]

"But that came to an end. People didn't continue the killing. And they didn't kill everyone who surrendered. Mammals aren't predisposed to murdering their own species; they engage in a primordial flight-fight posturing-or-submission process that naturally inhabits killing. *But replacing that with an insect-paradigm: That means killing without exception.* It could begin a self-destructive pattern that circumvents millions of years of evolution—in particular the safeguard that prevents humans from engaging in unlimited intraspecies slaughter."⁶¹

This exchange is pertinent not only to the ethical horizon of posthuman wars but also to assumptions about human exceptionalism that continue to inform speculative fiction primarily in the West. In Suarez's novel, swarm intelligence is portrayed as an unmitigated catastrophe, something that can fundamentally change the course of our evolutionary history as a species. Genocidal humans are portrayed as less dangerous than insect intelligence and drone swarms. The ground of catastrophic thinking here is deeply humanist. Insects and machines are an irrevocable other.

The catastrophic scenario portrayed in Suarez's *Kill Decision*, however, is far from preordained. As the sci-fi novelist Orson Scott Card notes, "predicting is a trivial aspect of writing science-fiction. We are extrapolating what would happen if a particular configuration of future possibilities became real. The result is we plunge readers into an environment in

which they must rebuild their conception of reality . . . we aren't predicting the future, we're helping readers rehearse for the future, whatever it might be."⁶² In most futuristic Euro-American depictions of robots, the configuration of possibilities that Scott Card talks about appears oriented toward human exceptionalism. Think of *The Terminator* or the *The Matrix* film series. Robots in these films are invariably depicted as the malevolent other fighting humans. This frequently frustrates robotacists. "There seems a strong tendency over the decades to view robots as something evil, like technology run amok," remarks a scientist.⁶³

The techno-paranoia of speculative artists in the West is, however, not shared in works from another cultural sphere where robots are a part of everyday life and sociability: Japan. One remembers the first robot character in a post-War Japanese manga series—Mighty Atom or Astro Boy—who keeps peace among humankind in the aftermath of Hiroshima and Nagasaki.⁶⁴ The varied cultural inflections of robotics offer an opening to imagine posthuman techno-animist forces beyond paranoid forms like the killer weaver swarms. In the final pages of this essay, I turn to a Zambian novel that conjures drone swarms in non-militaristic and micropolitical terms—as nonhuman agents of healing, transformation, and radical change.

Namwali Serpell's *The Old Drift*, a spectacular mash-up of genres—the postcolonial novel, magical realism, speculative fiction, and Afrofuturism—won the Arthur C. Clarke Award for science fiction in 2019. It is epic in scope, spanning Zambian lives across four generations, from the early twentieth century to the mid-twenty-first. The title is derived from a drift on the Zambezi river five miles above the Victoria Falls, the port of entry into the then North-western Rhodesia and the place where the Zambezi river is at its deepest and narrowest. It was from here that earlier white settlers ran a transport service across the river. Serpell unfurls her intergenerational canvas across two powerful technological developments in Zambian history: the building of the Kariba Dam and Edward Nkoloso's attempts to send Afronauts to the moon. These attempted conquests of water and atmosphere inhabit the novel's speculative sweep while grounding the narrative in precisely rendered historical events.

Parts of the novel are narrated by a non-human collective intelligence, a mosquito swarm that emerges as a Zambian uptake on the Greek chorus, "*thin troubadors, the bare ruinous choir, a chorus of gossipy mites*"; the song of the swarm forms a "*weird and coordinate harmony*" of nonhuman times both ancient and futuristic—at once an insect world from time immemorial and a cyborgian consciousness that has "*woven a wordly wily web . . . Spindle bodies strung in a net of spacetime.*"⁶⁵ The swarm buzzes, glides, and sways through the pages as it feeds us stories of its planetary intimacies

that precede human existence by millions of years. These intimacies eventually enfold the human and appear far from pestilential, at least from the swarm's point of view. The swarm's choric voice laments the folly of humans in treating mosquitoes only as disease vectors. Viruses carried by mosquito swarms are part of our evolutionary history, it tells us. "*And what do we leave you in kind of recompense? A salivary trace, a gum to stop your blood clotting. It's harmless but foreign, and your body is foolish, so it attacks itself in dismay . . . it sparks a histamine frenzy*" (OD 318).

In an audacious narrative pivot, the mosquito swarm becomes the inspiration for a technological and medical marvel. Joseph, an epidemiologist and scientist, discovers a vaccine for a viral affliction that remains unnamed in the novel. Those infected are referred to as having caught "The Virus." The specter of AIDS haunts the novel. Jacob, a tech wizard, designs drones inspired by the size and anatomy of the mosquito and sells them to the government. The purpose is not war. Jacob's automated swarm—named Moskeetoze—becomes the medium of mass vaccination of a population ravaged by the epidemic. The contrast with the deadly weaver swarm drones of Suarez's novel can scarcely be missed. Unlike drone acoustics in war zones that portend incineration with its whirring sound above, the cyborgian mosquito swarm evokes awe as it elegantly choreographs its descent, not to kill but to heal.

Then a new sound. At first Naila thought it was the congregants again, humming their way through the crowd. But this was closer to a ringing, the electric sound of pylons growing steadily unbearable. It looked like smoke was pouring through the air, cutting in and out of the cone of light. People shouted and the mother next to Naila pointed. Her boy nodded. *Mulilo*, he said. Fire.

But there was no burning smell, no searing heat, no flame. The smoke's syrupy sweep through the cone of light reminded Naila of a starling murmuration. It swung around, its ringing sound drawing near, then far, flooding thick, spiraling wide. Its outer edge swept past her and she saw tiny buzzing bits within it. Not smoke, microdrones.

. . . Naila felt the cumulative touch of them on her face and neck—a whispering feeling, as if a furry wind were passing by. Then she felt the gentle needling. A dozen twinges, a hundred, a thousand, each no more painful than a normal mosquito bite. The swarm—they were Jacob's Moskeetoze, she was sure of it, the one's he had sold to the government—had landed upon the crowd and begun to puncture them. (OD 542-43)

Having accomplished its mission, the drone swarm ascends in "measured spirals" and "skitter ed up into the cone of light" (OD 544). The vaccinated people look for the usual signs of a mosquito bite and find painless welts that don't itch. They have been rendered immune by the collective sting of the Moskeetoze.

The Moskeetoze perform yet another feat in the novel, that of eco-political sabotage. The drone swarm is mobilized in a political cause by a group of activists protesting the ecological ravages of the Kariba dam. The leaders—Naila, Joseph, and Jacob—place solar-powered transmitters in the dam’s sluices and program the Moskeetoze to find the transmitters: “Within minutes the sluice’s inner surface would be lined with their tiny bodies. Sluices often got jammed this way with detritus like leaves and sticks that the workers had to clean out, so the infiltration had to be subtle” (OD 554-55). Thousands of drones are released by this group through the night to cause a slight malfunction. Unexpectedly for its human creators, the swarm’s machinic logic takes over as it blocks the sluices completely. This unleashes a catastrophic flood that swallows the dam and all the inhabitants nearby, including Naila. The Zambezi begins flooding and the ecological landscape changes irrevocably: “Lake Kariba would soon become a river. The Dam would become a waterfall. And miles away, the Lusaka plateau, the flat top of Manda Hill, would become an island” (OD 559).

Swept away by the flood are all pretensions of a human-centered world: its little vanities, its delusions of grandeur, its quest for intimacy, its sense of political urgency, its moral righteousness, and its overweening need to control the nonhuman sphere. The novel ends with the swarm chorus, but is the voice that of mosquitoes or of the Moskeetoze? We enter a techno-animist realm where insects and drones are indistinguishable actants:

Are we red-blooded beasts or metallic machines Are we truly man’s enemy, *Anopheles gambiae*, or the microdrones Jacob designed? If that’s who we are, then this tale has explained our invention. The problem is we’ll still never know because . . . we have joined up with the local mosquitoes. We get along fine, but can’t tell us apart in this loose net of nodes in the air. We just buzz about and follow commands and live lives of tense coordination. Half insects, half drones; perhaps all drones or none; may be something will emerge. But what a joke! What an error! What a lark indeed! A semi-cyborgian nation! (OD 562)

The swarm’s volatility exceeds all efforts at meaning-making. Human finitude is stripped of its existential carapace and folded into the swarm’s techno-planetary churn: “*And so we roil in the oldest of drifts—a slow, slant spin at the pit of the void, the darkest heart of them all*” (OD 563).

UNIVERSITY OF VIRGINIA

NOTES

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- 26 The term “radiographic episteme” appears in Jeremy Packer’s essay, “Screens in the Sky: SAGE, Surveillance, and the automation of perceptual, mnemonic and epistemological labor,” *Social Semiotics* 23, no. 2 (2013): 189.
- 27 Gusterson, *Drone: Remote Control Warfare*, 38
- 28 <https://notabugsplat.com/>.
- 29 Nadeem Aslam, *The Golden Legend* (New York: Alfred Knopf, 2017), 77 (hereafter cited as *GL*).
- 30 George Brant, *Grounded* (London: Oberon Books, 2013), 45.
- 31 Brant, *Grounded*, 21.
- 32 All quotations appear in Matt Trueman’s “Harder, Faster, Louder: How Drone-Pilot Drama Shook the World,” *The Guardian*, February 28, 2017, <https://www.theguardian.com/stage/2017/feb/28/drone-pilot-drama-grounded-gate-theatre-lucy-ellinson-anne-hathaway>.
- 33 Two recent accounts include Daniel Greene’s “Drone Vision” in *Surveillance and Society* 13, no. 2 (2015): 233-49; and Thomas Stubblefield’s “In Pursuit of Other Networks: Drone Art and Accelerationist Aesthetics,” in *Life in the Age of Drone Warfare*, ed. Lisa Parks and Caren Kaplan (Durham, NC: Duke Univ. Press, 2017), 195-219.
- 34 The words are from Michel Serres’s *The Birth of Physics*, cited in Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, NC: Duke Univ. Press, 2017), xi.
- 35 Louise Amoore and Volha Piotukh, “Interview with Katherine Hayles,” *Theory, Culture & Society* 36, no.2 (2019): 146.
- 36 Hayles, *TCS* interview, 148. See also N. Katherine Hayles’s *Unthought: The Power of the Cognitive Nonconscious* (Chicago: Univ. of Chicago Press, 2017).
- 37 Bennett, *Vibrant Matter*, 120.
- 38 Teju Cole, “Seven Short Stories About Drones,” *The New Inquiry*, January 14, 2013, <https://thenewinquiry.com/blog/seven-short-stories-about-drones/>.
- 39 Luciana Parisi, “Critical Computation: Digital Automata and General Artificial Thinking,” *Theory, Society and Culture* 36, no. 2 (2019): 94.
- 40 An example of this divide appears is Katie Trumpener’s “Paratext and Genre System: A Response to Franco Moretti,” *Critical Inquiry* 36, no. 1 (2009): 159-71.
- 41 The breakdown of dialectical materialism, Jacques Derrida writes, is “demonstrated today better than ever by the fantastic, ghostly, ‘synthetic,’ ‘prosthetic,’ virtual happenings in the scientific domain and therefore the domain of techno-media and therefore public or political domain. It is also made more manifest by what inscribes the speed of a virtuality irreducible to opposition of the act.” *Specters of Marx: The State of the Debt, the Work of Mourning, and the New International*, trans. Peggy Kamuf (New York: Routledge, 1994), 79.
- 42 Cited in Chamayou, *Theory of the Drone*, 138.
- 43 Bradley Strawser, “The Morality of Drone Warfare Revisited,” *The Guardian*, August 6, 2012, <https://www.theguardian.com/commentisfree/2012/aug/06/morality-drone-warfare-revisited>.
- 44 <https://teleautomaton.com/post/1373803033/how-teslas-1898-patent-changed-the-world>.
- 45 See P. W. Singer, *Wired for War: The Robotic Revolution and Conflict in the Twenty-First Century* (New York: Penguin, 2009).
- 46 Ronald Arkin, “Ethical Robots in Warfare,” 32.
- 47 Arkin, “Ethical Robots in Warfare,” 31.
- 48 Hayles, “The Cognitive Nonconscious: Enlarging the Mind of the Humanities,” *Critical Inquiry* 42, no. 4 (2016): 788.
- 49 Christof Heynes, “Report of the Special Rapporteur on Extrajudicial, summary, or arbitrary executions,” United Nations Human Rights Council, Session 23 (April 9, 2013), 17.

- 50 Richard A. Clarke, *Sting of the Drone* (New York: St. Martin's, 2014), 61-62.
- 51 Much before drones became the go-to military machine, media theorist Friedrich Kittler wrote, "command in war must be digital because war is noisy." "Media Wars: Trenches, Lightning, Stars," in *Essays*, 119.
- 52 Paul Scharre, *Robotics on the Battlefield Pt II: The Coming Swarm* (Washington, DC: Center for a New American Security, 2014), 15.
- 53 See John Arquilla and David Ronfeldt's *Swarming and the Future of Conflict* (Santa Monica: RAND, 2000), about precedents of swarm warfare in history—Alexander the Great's central Asian conquests, Mongol invasions of Asia and Eastern Europe, Native American attacks on the Western frontier, and postcolonial guerilla warfare in Asia and Africa.
- 54 John Boyd cited in Scharre, *Robotics on the Battlefield*, 33.
- 55 *Emergence* is a term in second-order cybernetic theory that defines an entity having properties not found in any of its constitutive parts. Emergent properties arise due to a dynamic peculiar to the system as a whole and not its constituent parts. Cybernetics is the science of information that pertains to both machines and our bodies. Here is a description of first and second-order cybernetics: "First-order cybernetics remains inscribed within classical scientific thought: it holds on to humanist and idealist dualisms that describe the world in terms of an equivocal dialectics of matter and form, of substance and pattern, in which the immaterial wrests agency away from the embodied. . . . In neocybernetic [second-order] systems theory . . . the form/substance dichotomy is superseded by the distinction between form and *medium*." *Emergence and Embodiment: New Essays on Second-Order Systems Theory*, ed. Bruce Clarke and Mark Hansen (Durham, NC: Duke Univ. Press, 2009), 4.
- 56 See Adam Piore's "Rise of the Insect Drones," *Popular Science*, January 29, 2014, <https://www.popsoci.com/article/technology/rise-insect-drones/>
DoD is Department of Defense.
- 57 See "Swarm-bots: Swarms of self-assembling artifacts," The European Commission: Information Society Technologies, Future and Emerging Technologies Program, <http://www.swarm-bots.org> and https://www.supsi.ch/dti_en/research/progetti/in-evidenza/Swarmanoid1.html.
- 58 Singer, *Wired for War*, 130-33.
- 59 Daniel Suarez, *Kill Decision* (New York: Penguin Random House, 2016).
- 60 Suarez, *Kill Decision*, 168.
- 61 Suarez, *Kill Decision*, 343 (emphasis mine).
- 62 Cited in Singer, *Wired for War*, 159.
- 63 Singer, *Wired for War*, 165.
- 64 "Mighty Atom," *Tezuka Osamu Official*, <https://tezukaosamu.net/en/manga/291.html>
- 65 Namwali Serpell, *The Old Drift* (New York: Hogarth, 2019), 19 (hereafter cited as *OD*).