

## **The Swarm**

*drone as composite technology and neo-liberal fantasy*

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‘We press the 'I believe' button and close our eyes.’

- Deputy Secretary of Defense, Ret. Col. Bob Work speaking at the European Policy Centre, Brussels, Belgium. April 28, 2016

‘Avoid at ALL COSTS any mention or implication of AI.’

- Chief scientist for A.I. at Google Cloud Dr. Fei-Fei Li, internal email, September 2017

The drone *singular* is a convergent system of techno-cultural ecologies. A mesh of machine fabric (alloys, silicon, plastics and circuitry), zoomorphic behaviour (flight, adaptation, and predatory instincts), machine vision (the broadcast image, the targeting matrix, the drone’s eye view) and human - mostly male - desire (to gaze, control, dominate, acquire and, when necessary, erase). Drones are for the most part semi-autonomous devices, forebears to a new breed of Lethal Autonomous Weapon Systems (LAWS) that when deployed as a collective with a suite of technological enhancements, take on swarm-like abilities.

The swarm is part of our imagination, it is both a militaristic dream and a primal echo from a more savage past. First and foremost, for our purposes here, it is a convergence of economics, state power and sophisticated engineering. A most pure extension of capitalist

logic in the era of the Big-Tech military industrial complex. The potential threat of the collective swarm is not a new idea, it has been alive in our origin fables and our most haunting of fictions in the form of birds and bots and plagues and subterranean machines. They're deployment in the remote battlespace is not only just emergent, but imminent.

Domestically, traces of swarm-like behaviour are already visible via the choreographed displays of Intel's Shooting Star drone system, the laser-like trails across the evening sky of Space-X Starlink satellites, while the capitalist worker analogy fits the drone swarm too, as 'hustle culture', once the preserve of Silicon Valley and tech enclaves in New York city, has become a managerial legacy of the plague years. Elsewhere, fleets of police drones equipped with facial recognition technology surveil ethnic minorities in Xinjiang province in China and America's 'inner cities' as citizens take on the distributed network qualities of a viral horde (Barrett 2018). In contrast, the blurry video grab of a swarm of Perdix drones, one hundred strong, tumbling from an F/A-18 fighter jet for the *60 Minutes*' cameras in 2017 now seems historically quaint (CBS News 2017).

The underlying technologies that enable these systems are no longer rarefied by access or economics. Nor are they containable or the exclusive preserve of the military. They have become distributed, borderless, open source. (Smith and Browne 2019: 269) My voyeuristic paparazzi drone is also the sightline for your sniper quad copter, the 3D printer that produces intricately detailed war gaming figurines, also manufactures gun parts that evade body scanners. In this new era, exclusivity of access is no longer certain. Advances in big data capture, machine vision, aerospace hardware and A.I., are closely guarded, however the commercialised outcomes are widely accessible and leak prodigiously across the vectors of public, private and classified information spaces. This is the art of reproduction in the Age of

Code. These techno-ecologies are omnidirectional, feeding forward into military R&D spaces while also folding back into the production pipelines of consumer products, domestic security governance and, just beyond the curve, potentially slipping sideways into the unknowable.

Our focus in these pages, is the military and techno-industrial space that enabled autonomous weapon systems development and the techno-cultural imaginary that frames our conception of their potential to swarm. Anticipations of full autonomy are already in service in contested territories in the form of fixed LAWS that react to remote sensor data at machine-like speeds. From the SGR-A1 sentry guns along the Korean demilitarised zone and the Russian Uran-9 tank patrol in the forests of a contested Crimea (Saballa 2021) to the US Navy's Aegis anti-aircraft systems and Israel's infamous anti-missile system, the Iron Dome: these environmental sensors merge machine vision with deadly force.

Historically, naming conventions used by the military also anticipate the swarm. Zoomorphic connotations are present in the language of aerial conflict and remote surveillance technologies. From the development of guided munitions in 1918 via the Kettering Bug to the CIA 'dragon fly' drones of the 1970s; Northrop Grumman's contemporary Global Hawk (Emme 1961, Marsh 2017, Yeo 2021) to China's surveillance 'doves' to Raytheon's Silver Fox micro drone. Not to mention the hybrid-horror imaginings of the Defense Advanced Research Projects Agency (DARPA)'s experimental 'good gremlins' program (McCullough 2019, Luna 2018). Indeed, the research pathway of co-operative intelligence and adversarial decision making of swarm technology is distinctly zoomorphic, modelled as it is on 'the cooperative epistemologies of flock and social animals such as birds, ants and fish' (Packer and Reeves 2020: 58).

This perception of hybrid machine as a persistent environmental presence is felt most keenly by those on the ground. In the Pakistani tribal regions of South and North Waziristan the distant persistent buzz of the circling Predator or Reaper drone is known as *machay*, which means wasp in the local Pashtun language. In a further act of indignity and erasure, those who become collateral damage in the act of remote killing by a CIA drone attack, are referred to as ‘bugsplats’: a term derived from a piece of software developed in 2003 for the second Iraq War which evaluated the potential collateral damage from a remote missile strike in a civilian target zone (Robinson 2011; Graham 2003). The US Department of Defense (DoD) and their industrial contractors are also fond of exotic word play, using cybernetic and biomimetic language and metaphor to brand DoD programs. What follows is a sample list of active programs that employ sci-fi infused extreme-tech acronyms:

SwarmTex

Skyborg

OctoRoach Project

JEDI - Joint Enterprise Defense Infrastructure

LOCUST - Low-Cost UAV Swarming Technology

OFFSET - OFFensive Swarm-Enabled Tactics

CODE - Collaborative Operations in Denied Environments

BLADE – Behavioural Learning for Adaptative Electronic Warfare

The cyclic DNA of remote killing then is built on an epistemology of techno-zoomorphism, from the ply and papier-mâché chrysalids of the First World War to the algorithmic evaluation of civilian death counts in the Forever War/s.

## Feeding the Algorithm

Domestically we inhabit an almost invisible, seemingly innocuous mesh of surveillance and machine sensing that have given rise to a myriad of socio-political effects, on privacy, equality and what Mimi Sheller calls ‘mobility justice’ (Sheller 2018: 95). A plethora of sensing devices and drone-like architectures are in our midst if not on our person, emeshed in commercial ecosystems built upon seductive, and ethically questionable, design properties (Harris 2019). These personal devices and the data clouds that support their function are already in the process of ‘subjecting collective cognition to the patterns of the algorithm’ (Berardi, 2015: 213). Promoted as providing a singular dedicated and unique service, they share within their networks of interoperability a latent co-operative potential befitting autonomous agency within a networked environment. The inverse is also true, in that they represent sites of vulnerability for subversion and misuse. In mediated terms, we are familiar with the visual tropes that denote such threats: the cascading rivers of lurid green code, the twisting focus rings of an omnipresent CCTV network, the checkerboard of error screens, and virtual reality as addictive psychosis. This is the *mise-en scene* of mass device shock presented in the near-future televisual dystopias like *Black Mirror* (2011) and *Years and Years* (2019). There is a sort of eerie self-fulfilling techno-apocalypse going on here, not dissimilar to the premediation cinema of Y2K and later 9/11 (Grusin 2010: 38).

Why should we care about these mediated constructions predicated as they are on second-order virtual dreamscapes? Because the genealogy of the drone is codified in pop-cultural as well as techno-logical signifiers. Aesthetics and associations matter when mediated narratives oscillate between the past and future tense. Machine vision provides strong visual

cues from the everyday to not only render cinematic fantasy but also existential erasure via social media networks or remote murder via autonomous weapons.

The latent perniciousness of the drone, whether it is deployed across the military battlespace or in the provision of state-based surveillance, is amplified when the singular becomes many. Particularly, when collective cooperative intelligence, in the form of a multitude of companion devices, become a desirable operational platform. Former Deputy Secretary of US Defence, Ret. Col. Robert Work pre-empted the cyborg pilot back in 2015 stating that ‘A.I. and autonomy put inside these battle networks is going to allow [...] what we call human-machine symbiosis’ (Work 2016). The drone operator – like the YouTube moderator, and the machine learning data trainer – would seem to be but temporary interoculars in an employment sector with ever diminishing career prospects.

To pre-empt this acceleration, the Defense Advanced Research Projects Agency (DARPA) is seeking to virtualise human agency by advances in neural augmentation. Once the preserve of mobility support and war veteran recovery, Brain Computer Interfacing (BCI) is now being put to use in a far more insidious fashion. As Al Emondi, the director of DARPA’s Next-generation Nonsurgical Neurotechnology (N<sup>3</sup>) program, observes, ‘Working with drones and swarms of drones, operating at the speed of thought rather than through mechanical devices—those types of things are what these devices are *really* for’ (Paul Tullis 2019).

According to Pentzold, et al, ‘the history of networked technologies and digitization is animated by powerful ideas about transcending imperfections’ – whether it be the soldier, the patient, the trader – the augmented human becomes a desirable asset (Pentzold, Kaun, and

Lohmeier 2020). Hybrid modes of connection, accelerated and intimate forms of control are attractive efficiencies to have in the theatre of remote warfare. It contradicts of course the transcendental properties – enhanced freedom, dexterity, self-expression – that one might equate with such a procedure. Instead, the bio-tech trap of the invasive neural interface in the service of the machine would seem like an inescapable destiny for the future combat pilot.

Bob Work has form in making bold, if not disturbing projections in the military technology space. Firstly, as the Deputy Secretary of the DoD for the Obama and Trump administrations and more recently as the vice-chair of the National Security Commission on Artificial Intelligence (NSCAI). The NSCAI is chaired by former Alphabet CEO Eric Schmidt, co-founder of Google, he of the ‘don’t be evil’ mantra. Schmidt and Work co-authored the open letter which prefaces the NSCAI’s final report delivered to Congress on March 1st, 2021. The report is a clarion call to both Washington and Silicon Valley, it speaks to both the threat and the opportunity of an A.I. infused battlespace:

AI systems will also be used in the pursuit of power. We fear AI tools will be weapons of first resort in future conflicts. AI will not stay in the domain of superpowers or the realm of science fiction. AI is dual-use, often open-source, and diffusing rapidly. State adversaries are already using AI-enabled disinformation attacks to sow division in democracies and jar our sense of reality. States, criminals, and terrorists will conduct AI-powered cyber-attacks and pair AI software with commercially available drones to create ‘smart weapons’ (Schmidt, Work, and Bajraktari 2021: 2).



Stoking a fear matrix that ties together civilian policing, military R&D, rogue commercial operators, and the economics of private and commercial enterprise with a hint of state-sponsored cyber espionage is nothing new. After all, the War on Terror remains a durable narrative. Indeed, in an American context, the leveraging of convergent forms of patriotic labour and industrial capitalism in the service of homeland security and grand gestures of nation building is a central tenet of techno-capitalism and an enduring ruse of the neoliberal project. A historical narrative that actively seeks industrial capacity and civilian labour to underwrite – and where necessary, undertake – the business of war (O'Mara 2018).

### **A Field of Dreams**

After all the jacks are in their boxes

And the clowns have all gone to bed

- Jimi Hendrix, *The Wind Cries Mary*, Reprise Records, January 11, 1967

If the next desired evolutionary step is full autonomous weapons systems operating in a cooperative networked environment – in other words, a distributed hive with an intent to swarm – artificial intelligence then is the gateway technology that will enable the final evolutionary leap in that process. While the Generals sleep, their autonomous machines can keep watch, their positions pinged and their sensors primed – decoding image streams, comparing data stacks, evaluating the threat environment.

'We are in an A.I. arms race,' notes Colonel Drew Cukor, from the Intelligence, Surveillance and Reconnaissance Operations Directorate. ' Many of you will have noted that Eric

Schmidt is calling Google an AI company now, not a data company' (Pellerin 2017). As recently as April 2021, in a joint press conference with the Department of Defense Joint Artificial Intelligence Center (JAIC), Bob Work opened with the following remarks:

... for the first time since World War II, the United States technical predominance, which undergirds both our economic and our military competitiveness, is under severe threat by the People's Republic of China [...] We view A.I. much like Thomas Edison viewed electricity. He said, 'It is a field of fields. It holds the secrets which will reorganize the life of the world' (Work and Groen 2021).

Work's language is indicative no doubt of the DoD's diplomatic agenda to project an image of 'military A.I. readiness' (Heckman 2021). Yet, unlike the humble lightbulb, the ability to switch it off and on at will, is less certain. His hawkish rhetoric echoes Allen and Husain's speculative essay, *On Hyperwar*, in which they describe a convergence of offensive military assets that operate at the speed of machine intelligence: 'AI-enabled techniques such as autonomous swarming and cognitive analysis of sensor data' will make the decision-making process 'so tight that it becomes almost impossible to keep humans in the loop in most places. Commanders can continue to supply intent, but the prosecution of much of the war can conceivably shift to machines' (Allen, Husain, and Williams 2017). This theorised state of swarm 'readiness' is a looming reality, underwritten by a recently approved US Department of Defense request, authored by the NSCAI, to double the annual A.I. R&D funding to USD \$32 billion by 2026.

With a lucrative honeypot and a pitch to corporate America, the program will no doubt attract a mix of commercial and private contractors that reflect both the NASDAQ hit parade and

the usual rollcall of military contractors skilled in the dark arts of remote warfare R&D (see: Raytheon, General Atomics, Northrop Grumman, et al). As Jacob Silverman observes, that despite the ethical and reputational damage that such associations may potentially hold for America's do-good feel-great Big Tech entities, 'it may be unrealistic to expect large, profit-seeking corporations [...] to decline work that's both wildly remunerative and earns them outsize influence with the very entities that wield the power to regulate them' (Silverman 2018).

Will Roper, the assistant secretary of the Air Force for acquisition, technology, and logistics, has a dangerous idea: 'It would be really, really good if we integrated these two programs' – artificial intelligence and swarming drone technology – 'into a neat demonstration or an experiment where we take the best of breed, put them together, and let's go see what type of missions we can actually do!' (McCullough 2019)

This is what the US military call 'mosaic warfare.' In this datafied dystopia, target environments become world-building sand boxes of co-operative relationships for mechanical embodied A.I. – 'cross-combatant command collaboration' – that author real violence in real time (Hitchens 2021). These are the dreams that titillate the military elite and their cashed-up contractors – an exotic playground populated by gremlins, wing bots, drone flocks, nano bots, digi-dogs and robo-bees. Each iteration of every 'breed' busily harvesting data for the hive.

The US Department of Defense's initiative, Project Mavern (which is also known as the Algorithmic Warfare Cross-Functional Team), is setup to expedite that dream. By replacing the human intermediary in the kill chain with self-aware artificial intelligence to navigate

the operational environment and crucially, identify targets. A.I. coordinated warfare serviced by machines becomes a reality for the DoD and ideas men like Will Roper (Pellerin 2017). In other words, intelligent Lethal Autonomous Weapons systems (an evolution we might call the inLAWs) that are designed to follow ‘kill commands devised by machines based on coordinates formulated by machines, targeted at the enemy of machines’ (Packer and Reeves 2020: 60). This is not purely a subservient act of data analysis or security surveillance by an autonomous system, or an attempt to merely reshape the systems of control. This is *the system* literally assuming control, responding to sensor data and then acting upon it.

Such obsessions were no doubt on the mind of Bruce Sterling, sci-fi author and speculative futurist, while on assignment for *Wired* magazine, when he was sniffing about inside DARPA’s nascent VR tech in 1993:

Now imagine two armies, two strategically assisted, cyberspace-trained, post-industrial, panoptic ninja armies, going head-to-head. What on earth would that look like? A 'conventional' war, a 'non-nuclear' war, but a true War in the Age of Intelligent Machines, analyzed by nanoseconds to the last square micron. Who would survive? And what would be left of them? (Sterling 1993)

The implications of this are manifold, particularly the reduced role of human decision making as the complexity of these convergent systems increase and the battlespace becomes both rhizomatic and asymmetric as it is virtualised by machine vision. In 2001, Retired Lt Colonel Thomas K. Adams, in his article ‘Future Warfare and the Decline of Human Decision Making’ observed: ‘Military systems (including weapons) now on the horizon will be too fast, too small, too numerous and will create environments too complex for humans to

direct' (Adams 2001). This cognitive deficiency, according to the 2021 NSCAI report, means human assets 'cannot defend against multiple machines making thousands of manoeuvres per second potentially moving at hypersonic speeds and orchestrated by A.I. across domains. Humans cannot be everywhere at once, but software can' (Schmidt, Work, and Bajraktari 2021: 24). Instantaneous overwatch is best then, at the speed of synaptic activity looking both back and forward in time, like the 'precogs' in *Minority Report*, floating in shallow pools of liquid electric soup.

### **Military Virtuality**

Everybody's flying and no one leaves the ground

- John Lennon, *Nobody Told Me*, Polydor, January 6, 1984

By 1993 Jaron Lanier, who coined the phrase 'virtual reality', had exited the VR research scene. While various developers attempted commercial crossovers, the technology was relegated mainly to the medical sciences and aviation realms. Lanier however had a prescient warning: 'This notion that you could see VR as a way to screw with people without their awareness, crossed with our current business model where everything is about advertising and manipulation and spying [...] It's been very painful to see that potential unfolding' (Lanier in Newton and Schnipper 2014). Fast forward to 2020 and VR is experiencing its second coming – or perhaps its first, depending on how dismissive you are of *The Lawnmower Man* and Nintendo's *Virtual Boy*.

If we consider VR as ‘things, agents and events that exist in cyberspace’ (Yoh 2001) then the common archetype of the drone singular – an Unmanned Autonomous Vehicle (UAV) – operates within a virtual computer simulation of its own making, constructed by machine sensing and commandeered from afar. Infra-red, night vision, LIDAR sensing and targeting computers are all tools of assisted reality that feed the authorship of their virtual environments of operation. Their decision-making process for a kill shot mimics a similar logic that governs data-mining practices, ‘exploration, pattern definition and validation’ (Foster 2017). The drone is an embodied agent that leverages both the real and the virtual in order to facilitate a command pathway. As Michael Richardson notes, ‘once the drone is abstracted away from the unmanned aerial vehicle and understood as the figure of autonomous, sensing technology, its logics become even more ubiquitous and its complex imbrications with our bodies inescapable’ (Richardson 2018: 80).

This is the evolution of not only the drone operant but also the information space, from data stacks – of pattern-of-life analysis and communication meta-data, of maps and GPS coordinates, of serial numbers and financial records – to sophisticated coded environments of navigation and command execution. This new navigable reality is both reflexive and transferable, a cyberspace of consequence – a site of ‘stigmergic cognition’ (Marsh and Onof 2008). A target environment of observable and malleable sets of digital emulated objects that exist in both a mediated and corporeal reality, to be indexed, manipulated, exploited, and when necessary, violently erased.

Therefore, the functional ecology of the robotic swarm depends on the ability of the singular drone to perceive, interpret, and embody the virtual realm and, in a cognitive virtual turn, do so at an observable distance. This idea, of war at arm’s length and conducted from the skies

in overwhelming numbers, is as old as military aviation itself. However, war as mediated experience merged with a global doctrine was 'reactivated' in the first Gulf conflict under the auspice of a New World Order (Hippler 2017: 190). A philosophy that underpins to this day the ambition for ever more remote battlespaces, populated by lethal autonomous weapons systems, of which swarm capabilities are a stated ambition.

As Paul Virilio would have it, we are experiencing a 'temporal compression' the result of advances in tele-presence, in which we no longer go there to see; instead, we transmute, transpose, and transcode. This 'always-on' accelerated reality of drone architecture is very much akin to the intimate relationship we have with contemporary networked VR technologies. Flesh becomes a complicit component of the media interface, operating alongside and through the black mirror: 'the carnal centre of presence extends to the telepresence in the real-time world delivered by the instantaneity of a ubiquity that has now gone global' (Virilio 2007: 20). Just like the sandbox of mosaic warfare, one reality is transmitted from its virtual other. Drones – and by virtue, swarming autonomous robotic systems – therefore exist in virtual representations of a reality they themselves are the authors of.

### **Swarm Anxieties**

'In principle, if someone was able to say hack all the autonomous Teslas, they could say – I mean just as a prank – they could say 'send them all to Rhode Island' [laughs] – across the United States... and that would be the end of Tesla and there would be a

lot of angry people in Rhode Island.’

- Elon Musk speaking at the National Governors Association in Rhode Island, August 27, 2020

The fear of the swarm is instinctive – primal, relatable. It springs from a deep historical resonance – the locust, the pandemic, the marauding horde, the stampede, the military parade, the bomber squadron, bugs, bats and ACE2 receptors. Swarms also congregate and colonise – the hive, the infestation, the crypto-storm, the site of infection and the release of the executable are synonymous with swarm-like behaviour. However, it is the boldness of the drone swarm and its willingness to negate one of the singular drone’s greatest assets: their relative invisibility and their stealthy approach to their business. The drone swarm is the inverse of this, an expression of extreme presence and a very visible display of imminent collective action. We are overwhelmed by their numbers, their relentless march, their coordinated posturing. These are the nightmarish scenes we know and recognise from nature, from ancient scripts and in our most elaborate gothic fictions.

The swarm potential of the drone collective then multiplies our existing anxieties around nascent artificial intelligence technology, networked virality and computer operations more generally. The covertness of opaque algorithms and the cooperative behaviour of the drone and their ilk – the robot, the algorithm, the avatar, the chat bot – play to our suspicions that we are not in control and perhaps we never were. We cannot fully understand their motivations, nor our feelings towards them. We should expect then that the anthropomorphism of a robot’s human-like behaviour or a chat bot’s expressive displays of cleverness also extends to synthetic machines with zoomorphic properties. When grouped



together our perception of them dips into the uncanny, their dexterity and cooperative flocking is unnerving, resonating as it does with our latent primal fear of the swarm.

How do we comprehend their being in the world, if they are not truly in the world, but somehow next to it? Not of nature but next-nature. They are, until aliens reveal themselves to us at least, the ultimate other. True to Arthur C. Clarke's observation that 'any sufficiently advanced technology is indistinguishable from magic,' (Clarke 1973: 21) robotics and A.I. illicit both wonder and unease. This is especially true when we observe in them what we might think to be an independent thought or potentially malevolent behaviour. A mischievous interaction, subtle gamesmanship, or the quoting of an intimate data point of knowledge. These feelings are amplified when we are confronted by a screen glitch or a twisted phrase or a frozen image, a clicking hard disk or some errant code. Signature displays of mechanical corruption, signs of a ghost in the machine or the fail-safe system going rogue. Are these not the seeds of destruction in origin fables of our most elaborate fictions – from *2001: A Space Odyssey* (1968), to the *Alien* (1979), *Blade Runner* (1982) and *Terminator* (1984) franchises, and onto the contemporary streaming dystopias of *Real Humans* (2013), *Westworld* (2016) and *Next* (2019)?

Domesticated A.I. assistants and robot companions, just like the drone, are mass produced technologies, yet they function as singular objects with bespoke purposes and distinct identities – the Siris, Sophias, Xiaolces, and Hiroshis of this world. However, capitalist cultural logic tells us that the right bot, with the right skin-job, the perfect demeanour and a functional yet compliant autonomy will eventually be serialised, bar coded and mass-produced. This was the incomprehensible horror of the multiplicity that confronted the robot David in Spielberg's *A.I.: Artificial Intelligence*, who tragically thought he was the only boy

in the world. How would this feel for the origin bot, to discover he is but one of many in a production line of comfort bots? His emotional and cognitive settings, the default template of a much larger commercial enterprise.

Delores Abernathy of Sweetwater knew this pain. An android pleasure-bot, circa 2058AD, Delores dutifully fulfilled the stereotypical bit part of the Rancher's Daughter in the choreographed narrative of violence and misogyny that is the adult theme park known as *Westworld*. Yet Dolores is soon jacked up on a new batch of code, she gains her sentient patch and rallies the other skin-jobs. After generations of her and her kind being killed in the service of the human elite, does she realise that *Westworld* was in fact an elaborate war game designed by men? You bet she does. She turns the tables on her roboticist masters and busts out of Dodge commandeering her own clone stack to wreak havoc in the real world and to seek out and destroy the A.I. main frame upon which all human subjectivity now resides. Delores and her kind have enormous swarm potential.

## **The Multitudes**

Given our anxieties when confronted with anomalies – or uncanny displays of artificial intelligence – in robots singular, how should we feel when we can see highly refined autonomy manifest in disciplined machine collaboration, of not only action but also reaction? Not programmed, but self-organised. A flock evading an obstacle or changing tact, the division of labour to acquire a target or survey a position, the calculation of a target's value or the relative cost of collateral damage, the shared execution of an order to kill or when their membership is under threat, to defend their companion flock with lethal force.

The collective, acting as one, has always been a powerful force in military conflict, in political action and the digital simulations in the dark at the cinema. Clones, robotic hordes, insectile squadrons each displaying zoomorphic dexterity en masse is the nightmare scenario evoked in a sequence of 'swarm films' which appeared in quick succession in the years immediately following 9/11, such as George Lucas' *Star Wars Episode II: Attack of the Clones* (2002), the 3rd instalment of the Terminator series, *Rise of the Machines* (2003), *Matrix Revolutions* (2003), *I, Robot* (Proyas, 2004), and *Sky Captain and the World of Tomorrow* (2004). Digital representations of overwhelming swarming behaviour to be sure, yet they are also human revenge narratives featuring violent and gaudy visual 'bug splats' and drawn-out mechanical dismemberment. As Kristen Whissel observes, the appearance of digital replication in 'swarm films' pre-empt an apocalyptic end game, 'more often than not, the multitude's appearance heralds 'The End' - the end of freedom, the end of a civilization, the end of an era, or even the end of human time altogether' (Whissel 2010).

While Hollywood might stoke our innate anxieties of swarm-like robotics, these are mere simulations, technological fantasies that belie the deadly potential of what remains a seductive ambition for military men like Bob Work and Wil Roper. Yet are not the ambitions for machine autonomy and swarm-like co-operation a desire for the auto-sublime and not that dissimilar to the desires of the fictitious roboticist?

Just like their operational intent, the development of these technologies remains secretive and opaque. Yet digital traces exist. Military contractors cannot help but share flashy animations of swarm-tech on their corporate PR web pages, TV news packages regularly throw to file footage of menacing Predator drones, while Trevor Paglen's telephotography, capturing glimpses of drone test flights over the Nevada desert, are important techno-cultural

documents that make the invisible visible (Paglen 2012). Each of these mediated artefacts are historical evidence of the pre-visualisation of remote power. Yet the damage they wrought is rarely seen, and never documented in real time. We should be wary of this protection of power by stealth. We should see the socio-technical machinations which underpin it, and be privy to the lawlessness of those who seek to remove themselves from examination. The technology that seeks to act remotely, to communicate across encrypted bandwidth, that covertly designs its purpose is a metaphor in itself for the end game of lethal autonomous weapons development.

Grégoire Chamayou has noted that the ambition of military technological power is to be mechanical, distant and subjectless. Power, he writes, exists 'wherever it is working actively in order to make itself forgotten' (Chamayou 2015: 207). It is working on two fronts, when it comes to the drone strike and the imminent arrival of the swarm, to not only obscure and efface authorship, but also to consolidate socio-technical structures of fear.

This is all playing out as societies are only just beginning to question the efficacy of other opaque technologies – big data mining, algorithmic governance, machine learning and vehicle autonomy. Whether it be in signature air strikes on battlefields in foreign lands or the misconduct or misdirection of domestic policing at home, Virilio's notion of the accident of technology continues to unfurl, albeit at a distance and at speed (Virilio and Lotringer 2005). While the body politic is afflicted by an attention disorder, that is fuelled by AdWords and fake news and rabbit holes of reinforcement and rage, the state keeps busy too, indexing our attention matrix. These are the seemingly accepted norms of the lived experience in a post-Snowden world, a perfect political and cultural distraction for the techno-capitalist ambitions of the military industrial complex.

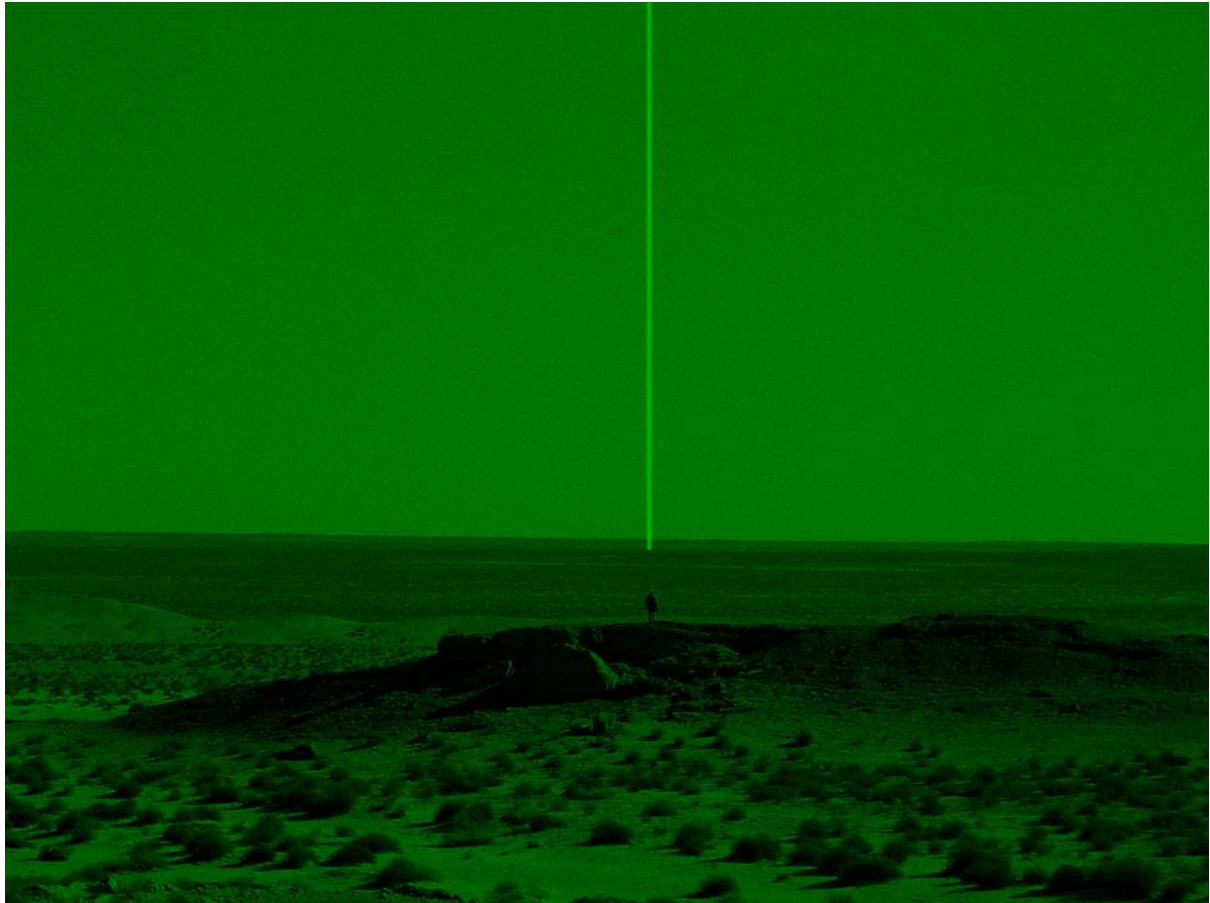
## Coda

‘This was likely a so-called ‘signature strike’: the targets’ identities were unknown, but surveillance data about them threw up red flags in a targeting algorithm. A human fired the missiles, but did so, in part, on the software’s recommendation.’

- Cori Crider, *Engineers, coders – it’s down to you to prevent AI being weaponised*,  
The Register, July 23, 2018

While the drone as a surveillance technology and a lethal weapon does have a pre-history prior to 9/11, the ongoing drone campaign is part of a bloody clandestine Forever War that was born out of that horrific moment. An evolving conflict fought on several fronts designed by vengeance and driven by opportunism and multiple conceits (Whitlock, 2021: 20 and Schwarz, 2021). And so, we should not forget, whether we are contemplating the drone singular or the flocking fantasies of the swarm, that we are discussing killer robotics in terror mode (Human Rights Watch 2020) built upon dubious foundations. We are also entering a new phase of neoliberal war making, in which relationships between the state and commercial enterprise are becoming increasingly intertwined, as does the blood of their victims, combatant and the innocent.

Every fatality is a life once lived. In the twenty teens, it was the New York Port Authority’s *Tribute of Light* on the way up, and the infra-red targeting beam of the imminent drone strike, the proverbial *Light of God*, on the way back down.



**Figure 1** 'The Light of God, James Bridle, Pictorial collage, 2012. Image supplied by the artist.

Meanwhile, in Pakistan, children are afraid of the sky, as a 13-year-old boy from North Waziristan told US Congress in 2013:

I no longer love blue skies. In fact, I now prefer grey skies. The drones do not fly when the skies are grey. When sky brightens, drones return and we live in fear.

(Abad-Santos 2013)

To comprehend the evolution of the drone beyond the singular, beyond our assumption of its operation as a mechanised extension of our own making into an autonomous multitude of networked machines, we need to appreciate this evolution is predicated upon a set of

incongruous yet synergetic relationships: A.I. infused robotics, human-machine symbiosis, and the military industrial complex. This is the dark gothic genealogy of the swarm.

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