Transformations issue 31 (2018)
www.transformationsjournal.org

ISSN 1444-3775

Drone Capitalism

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ABSTRACT

Like so many technologies before it, the drone promises liberation from the burdens of human existence: from work, wanting, waiting and even war. The drone, we are told, will watch our cities and our borders, it will deliver our goods and dispose of our enemies. It will do all this while keeping human bodies – or, rather, certain select human bodies – safe from harm (Chamayou 2015). Yet once the drone is abstracted away from the unmanned aerial vehicle and understood as the figure of autonomous, sensing technology (Andrejevic 2015), its logics become ubiquitous and its complex imbrications with our bodies inescapable. Essential to the emergent drone assemblage and to the affective form of its promise is the rising tide of techno-capitalism: military manufacturers, tech giants, start-ups, robotics labs, venture capitalists (Benjamin 2013, Gusterson 2017). This enfolding of military, industry and finance capital into the networked and mediating infrastructures of contemporary life means that drone capital is increasingly entangled in daily life, impinging upon bodies and producing new modes, forms and flows of relation between the corporeal and the technical. Thus the promise of the drone is also the promise of a future transformed: of modes and flows of capital freed even further from the strictures and constraints of human labour; of space and temporality controlled; of technoaffected experiences of the body itself. Tracing the movements of drone capital from military expenditure, automated finance and logistics, this paper maps the affects of hope and anxiety that accumulate around the ambivalent figure of the drone and its bodily entanglements, impingements and potentials.

KEYWORDS

Drone, enclosure, affect, capital, autonomous techology

Drone Capitalism: Affect, Autonomy, Body

Like so many technologies before it, the drone promises liberation from the burdens of human existence: from work, wanting, waiting and even war. The drone, we are told, will watch our cities and our borders, it will deliver our goods and dispose of our enemies. It will reshape disaster relief, enable medical support to remote communities and transform scientific monitoring. And it will do all this while keeping human bodies – or, more specifically and importantly, certain select human bodies – safe from harm. For those deemed expendable – whether in the tribal zones of Pakistan, in Yemen, in Gaza, or elsewhere – the drone is a figure of deep and abiding anxiety, a haunting ever-presence of potential violence. For others across the world, the drone is a far more ambivalent figure: it offers security at the price of surveillance, new modes of vision at the cost of the sky's closure. In the form of the unmanned aerial vehicle, the drone has swiftly become the physical embodiment and enactment of enclosure within globalised economic and military apparatuses. Yet 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. Essential to the emergent drone assemblage and to the affective form of its promise is the rising tide of techno-capitalism: military manufacturers, tech giants, start-ups, robotics labs, venture capitalists, logistics, cloud infrastructures, social media platforms and telecommunications providers, to name but a few. As fields of life from security to finance to domesticity are enfolded into networked and mediating infrastructures defined by remote sensors and autonomous systems, the figure of the drone is increasingly entangled in the everyday, impinging upon bodies and producing new modes, forms and flows of relation between the corporeal and the technical. Thus, the promise of the drone is also the promise of a future transformed: of modes and flows of capital freed even further from the strictures and constraints of human labour; of space and temporality controlled; of techno-affected experiences of the body itself.

Tracing movements and processes of drone capital, this speculative essay maps the techno-affects that accumulate around the ambivalent figure of the drone and its bodily entanglements, impingements and potentials. Here, the term "drone" captures three distinct levels of meaning: as remote sensing device (whether unmanned aerial vehicle or networked thermostat), as process of autonomous perception, and as the cultural figure or metaphor for autonomous technologies of perception. None of these levels operates in isolation from the others, nor are they intended to be extricable from one another. Yet in different contexts, different aspects of the drone obtain greater prominence and significance: this is precisely the value of deploying "the drone" as the anchoring concept for a set of tendencies, formations and activities that are proliferating and consolidating within contemporary capitalism. These cohere around the autonomous abstraction of data from life via technologies of perception, but also the production of value through the material construction, sale and deployment of autonomous sensing systems, whether unmanned aircraft or algorithmic trackers. Like drone warfare, drone capitalism operates on and over populations and bodies

reduced to sites of perception, exploitation and control. In short, then, I use the term "drone capitalism" to describe practices of value production that intersect in multivalent ways with the autonomous sensor.

In what follows my intention is not to provide a comprehensive account of the interconnections between drones and capital, but rather to propositionally sketch the conceptual framework for a theory of drone capitalism. Drone capitalism, as I intend to show, is an emergent phenomenon within what Mark Fisher calls capitalist realism, or the way in which "capitalism seamlessly occupies the horizons of the thinkable" (8). For Fisher, contemporary capitalism is powerful not simply because it incorporates resistance and subversion, but because of their "*precorporations*: the pre-emptive formatting and shaping of desires, aspirations and hopes by capitalist culture" (9). In keeping with Fisher's framing, I am interested in drone capitalism as both economy and culture. My claim is that something is going on that can be both made visible and critiqued through the figure of the drone. Drone capitalism is thus both a heuristic and an emergent material phenomenon. Throughout this essay, I move with varying intensity and depth between three contexts for the drone and its relationship to flows of capital and techno-affected bodies, bodies that are both human and non-human: security, finance and the home. Each of these contexts provides a different entry point and emphasis for this thinking-in-theory of drone capitalism, which proceeds in four parts. First, I consider the way in which the drone both encloses and enfolds bodies by bringing together work by Ian Shaw and Mark Andrejevic that theorises drone dynamics from, respectively, the outside in and the inside out. In doing so, I argue that recognising the techno-affectivity of drone systems is essential. Understood in the Spinozian tradition as dynamic relations that produce differential changes in capacity, affect need not be confined to the human: socio-technical systems are rich with non-human intensities of relation. Yet affects that are all too human also accumulate around the drone in processes of enclosure and enfoldment, which are in turn inseparable from what the drone promises. Second, I explore the relationship between labour and autonomy in drone capitalism, with a particular focus on the imbrications of hope and anxiety that this entails. Next, I move to map the rearrangements of space and time that have been leveraged and infiltrated by drone capitalism. And finally, I speculatively evoke the techno-affectivities of drone capitalism as it encloses, enfolds and eludes bodies in finance, security and the home.

Enclosed and Enfolded in the Droneworld

The drone's promise comes at a price. Its regime of surveillance and datafication simultaneously encloses the world and enfolds bodies. Just as it has been so crucial to new modes of power and living from property relations to colonialism to the current dominance of computational media, the specific dynamics – material, discourse and affective – of this dual process of enfolding and enclosing is crucial to the form of capitalism defined by the drone. It is this dynamic that builds the impetus for its expansion into new fields of work, across time and space, and into

increasingly intensive relations with more and more bodies, both human and otherwise.

Enclosure concerns more than the division of space into bounded or fenced off zones. Drawing on a rich history of research on economic, colonial, informational and other forms of enclosure (Hardt and Negri; Linebaugh; Hodkinson; Poster, *The Mode of Information*; Andrejevic, "Surveillance"), Ian Shaw points out that the process "also expresses a much broader set of themes about historical acts of appropriation, confinement and segregation" (6). As is well known, the enclosure of the English commons not only created private agricultural zones, but also fractured and remade agricultural communities, workers and ways of life. As enclosure spread across the globe through colonisation and then globalisation, it "left in its wake a deworlded and alienated humanity" (255). For Shaw, the emergence of drone technologies has enabled a degree of enclosure previously unimaginable: a planetary system of containment; a droneworld. This system is fundamentally "a project to bring the planet's inhabitants to the great *inside* of technological civilisation: on the inside of its legal regime, on the inside of its economic system, on the inside of its architectural spheres, and on the inside of its surveillance apparatuses" (7). As a process, enclosure within the droneworld knots together multiple systems of power, communication and exchange. Containment within bounded space is, in other words, concerned with both security and economy. Yet rather than enabling heterogeneous forms, modes and practices, enclosure is also concerned with closing off or delimiting contradictory or divergent ways of living. That is, enclosure is containment *within* global capitalism, just as it is enclosure within expansive state security regimes.

Processes of enclosure are intimately related to dominant forms of media and communication. As Mark Poster argued as early as 1990, not only is it the case that "history may be periodised by variations in the structure in this case of symbolic exchange, but also that the current culture gives a certain fetishistic importance to 'information'" (*The Mode of Information* 6). In the contemporary "mode of information" (a play on Marx's mode of production), the electronic self is "decentred, dispersed, and multiplied in continuous instability" (6), such that "subjects now float, suspended between points of objectivity, being constituted and reconstituted in different configurations in relation to the discursive arrangement of the occasion" (11). More recently, Poster has suggested that the proliferation and infiltration of the digital now means that we live in an "information empire" that is global in scale (*Information Please* 46–66). For Andrew Murphie, the current movement to artificial intelligence, algorithmic cultures and networked everything constitutes a "third enclosure, which is simply put that of everything that has not already been enclosed" (29). Thus, the tendency of the drone and its distributed systems to enclose the world is also a tendency towards investment in the myriad industrial dimensions of drone production, operation, maintenance and regulation, as well as a tendency towards what Andrejevic calls "digital enclosure," or "the forms of productivity and monitoring facilitated by ubiquitous interactivity." Digital enclosure "has the potential to facilitate unprecedented commodification of previously non-proprietary information and an aggressive clamp-down of centralized control

over information resources" (Andrejevic, "Surveillance" 297). What's more, this enclosure extends to the contradictions inherent to capitalism *and,* as Fisher points out, to the very capacity to think outside it. Drone capitalism wants to enclose because enclosure is what makes possible its own growth via both expansion and infiltration. Capitalism intensifies the droneworld; the droneworld intensifies capitalism.

Yet while enclosure describes the vectors of power that operate from the outside in, it is less helpful in accounting for those that work from the inside out. For Andrejevic, understanding the full implications of drones means "abstracting away from the figure of the 'unmanned' flying device" ("Drones" 21) to reveal "drone logic: the deployment of ubiquitous, always-on networked sensors for the purposes of automated data collection, processing, and response" (22). This dual process of abstracting and unfolding shifts the emphasis to "the infrastructures associated with drone deployment – and the political and economic implications of control over these infrastructures" (22). But it also "means considering the ways in which distributed probe networks automate interactivity and result in large amounts of data that are centrally processed" (23). In the military sphere, this data might range from high-definition video to GPS coordinates to flight sensor information. In the home, it might include voice commands, products, songs played, or power consumption. In the domain of finance, it could refer to price fluctuations, trade volumes, or shifts in interbank interest rates, such as the LIBOR. Yet what the "droning" of the contemporary world means is that "military and commercial applications blend into one another and inform one another" (26). Andrejevic calls this "dedifferentiation," but the inflection I want to give to the phenomena is better captured by the *enfolding* of domains, along with objects, processes, infrastructures, networks, bodies, signals, data, and more. It is this process of enfolding that describes coalescence, confinement, and control *within* the enclosure of the droneworld. The droning of human activity, in this sense, is the slow enfolding of life into drone capitalism. In his work on digital enclosures, Andrejevic places an emphasis on processes of interactivity as the key site for capture of information, but in drone capitalism interactivity is secondary: it is the combination of always-on, always-collecting capacities of autonomous systems and their generation of and through milieus of techno-affective intensities that marks drone capitalism as an increasingly distinct set of phenomena.

As should be apparent at this point, enclosure and enfoldment are not at all easily differentiated: the two terms refer to explicitly interdependent processes that operate at different scales and along different vectors. Enclosure operates from the outside in and originates in the macro-dynamics of institutional, discursive and technological forces, whereas enfoldment occurs inside to out, emerging from the micro-social milieus and minor encounters of the everyday. Both processes are fundamentally *techno-affective*. While the neo-Spinozan approach to affect marshalled here recognises its presence in all encounters between bodies understood in the most generalised sense (Deleuze and Guattari), *techno-affect* delineates dynamic relations of intensive potential for change between constellations of bodies in which the non-human takes on a catalysing status. "Affect," write Gregg and

Seigworth, "can be understood then as a gradient of bodily capacity – a supple incrementalism of ever-modulating force-relations – that rises and falls not only along various rhythms and modalities of encounter but also through the troughs and sieves of sensation and sensibility, an incrementalism that coincides with belonging to comportments of matter of virtually any and every sort" (2). This is what Brian Massumi famously called the *autonomy of affect*: its intensive presence wherever a difference between bodies of whatever kind can be found. As Jan Slaby and Rainer Mülhoff make clear, affect's relational dynamics are the stuff from which individual bodies assemble: only through individuated emergence within fields of relations do bodies come to matter as such.

In the context of drone capitalism, vast and shifting fields of relationality occur distinct from human bodies: the unmanned aerial vehicle autonomously responds to ever-changing wind and pressure; the algorithmic trade executes in microseconds of barely perceptible market movement; data flows from sensors to databases stored in cloud architectures, monitored by everything from digital daemons to finely tuned heat sensors in the depths of server farms. Yet techno-affects are more than simply the vital forces of the assemblages that I am collating under the term drone capitalism: techno-affects are in the very relations that are harnessed and exploited by drone capitalism, whether in their technical flow, impingement upon human bodies, or their explicit manifestation as the hopes, fears, anxieties and wonders that accumulate around the figure of the drone. Of course, capitalism is always affective, and not just in the way everything is always affective. As Massumi has shown (*The Power at the End of the Economy* 1–17), affect is located at the very core of capitalist rationality, but it is also the animating force and site of exploitation of much capitalist activity. Consider, for example, the way in which Facebook transforms likes into value or home security companies turn fear into sales, or, indeed, how desire itself entails all manner of intensive affects. Thus, while drone capitalism does not describe a difference in kind – it is still capitalism, after all – it does describe a difference in intensity and locus in the conjunction of enfolding and enclosing dynamics, autonomous sensing and intensive milieus of techno-affectivity.

This techno-affective dynamic of enclosing and enfolding structures the conditions, possibilities and terms within which the drone's promises are proffered. For the ailing manufacturing sectors of the West, drone production promises new jobs led by innovation, rising demand and the proliferation of uses for drones. Yet such manufacturing is itself often droned by semi-autonomous processes and robots, as well as enmeshing wider and wider sections of the economy within the security apparatus. "Angel Drones" promise "the safe and timely transportation of blood, plasma and other urgent medical aid to remote communities" and in so doing further enfold the biopolitical regime of the modern health care system within the drone enclosure (UAS International). Amazon's drone delivery project Prime Air, promises delivery of items in under 30 minutes, enfolding the immediacy of desire emblematic of contemporary consumption into the "need" for further expansion of the droneworld. Yet it also targets delivery and distribution jobs, promising a reduction in the need for one of the few manual forms of labour that has seen growth as a result of e-commerce.

Abstracted from the unmanned vehicle, drone capitalism's enclosing-enfolding dynamic is even more pervasive: the collection, aggregation and mining of data across every field of encounter with networked objects that sense, record and transmit our daily lives.

This shift to bring an exponentially expanding range of life within the ambit of capitalism is constitutive of capitalist realism in the age of biopolitics and control. Since its modern manifestation beginning with the industrial revolution, "capitalism created a machine-mediated reality" (Shaw 62). In our era of neoliberal governance, Jodi Dean argues that these processes of mediation have led to communicative capitalism, in which communication is not simply a tool in the production of value via factory labour but that from which value is extracted (*Publicity's Secret* 3–4). As such, "the deluge of screens and spectacles coincides with extreme corporatization, financialisaton and privatisation across the globe" (*Democracy* 23). Communicative capitalism is "democracy that talks without responding," reducing democratic aspiration and the demos itself to the market and its desires (22). Understood in the abstract, inclusive sense proposed by Andrejevic, drones are accelerating the degree, complexity and extent of this machine mediation. This expansion is in keeping with what Nick Srnicek calls *platform capitalism*. As Srnicek points out, capitalism is always expansive: it "demands that firms constantly seek out new avenues for profit, new markets, new commodities, and new means of exploitation" (3). In the twenty-first century, "the platform has emerged as a new business model, capable of extracting and controlling immense amounts of data" (6). These platforms – Google and Facebook, but also G.E., Siemens, Spotify, Salesforce, Uber, Airbnb and others (49) – are all dependent in varying ways on the automated information capture and processing constitutive of drone logic. They are as much a part of drone capitalism as the military manufacturers and purchasers or the domestic drone insurers. Like the infrastructure of the internet itself, platforms are inseparable from the connective architecture of drone capitalism.

These twinned tendencies towards enclosure and enfoldment common to so much of the digital link the wider dimensions of contemporary capitalism to that particular mode that I am calling drone capitalism. Like twenty-first century capitalism in its most commonplace and familiar forms, drone capitalism depends on the dual presence and continual interplay of affective and productive labour. While the drives to enclose and enfold shape the externalities of drone capitalism, its effort to abstract and instrumentalise affect are essential to its impingement upon human bodies. Across the remainder of this essay, I sketch these techno-affective dynamics across labour and its relation to autonomy, rearrangements of space and time, and the experience of bodies caught within drone capitalism.

Drone Labour

According to its website, the Nest Learning Thermostat "automatically adapts as your life and the seasons change" (Nest). This promotional claim appears just below a digital counter tracking the kWH of energy saved by the Nest since 2011, directly linking this adaption to energy consumption and

sustainability. Here, then, is one promise of the autonomously sensing drone: individualised modulation of energy usage as a contribution to an affordable life and sustainable planetary future. The device itself is innocuous enough: using manual inputs, automatic sensors and smartphone integration, it learns your temperature preferences and daily routines to optimise heating and cooling. But in doing so, the Nest is also accumulating troves of data about you, your family and your daily activities. This data is valuable, not just in its translation into savings on your energy bill or in reducing carbon emissions, but in its quantification of life in the home. That data – mined, processed and presented to become useful knowledge – has value to other actors, from energy producers to insurers to marketers. Its collection entails labour, but not in the traditional sense of employment or purposeful work. Scholarship on digital economies has given this various names, including hyperemployment (Bogost), free labour (Terranova) and cyber serfdom (Wajcman). Here, the private space, movements and activities of life are abstracted into economic value, yet this and the labour that produced it exist in a relation of relative autonomy. To reap the benefits of the Nest, one need only minimally engage it –while the device autonomously harvests huge quantities of data. All this requires the Nest to be networked into wider digital infrastructures, as well as to be willingly yet largely imperceptibly enfolded into the daily life of its users. The Nest is both an affect monitor (it tracks and records movements of bodies, shifts in temperature, temporal differences in socio-spatial environments) and an affective machine (it shapes the way the home feels at the surface of the skin, it affects flows of data into cloud databases). As Andrejevic notes, there is a twofold purpose behind datafication processes such as this: "both creating as complete an archive as possible and of using this as a means of projecting into the future" (27). It is this potential to model future behaviour, needs and wants that makes domestic data so valuable. As remote, semi-autonomous sensors that accumulate and process the affective fields of their environment in the interests of generating profit, the Nest and technologies like it are one manifestation of drone capitalism in which the drone as device and process takes precedence and its figural force necessarily fades, since the Nest tends towards eventual invisibility. Yet there are numerous other forms of drone across diverse fields of social and economic activity. While their forms and specific manifestations differ, they are all defined by an affective dynamic between autonomous technology and labour.

Drone capitalism thus operates within the wider transformation of labour by robotics and automation. Drones in the form of unmanned aerial vehicles are already at work, of course, in agriculture (Krishna), border security (Vukov and Sheller), journalism (Carroll), film and television production (Christiansen), and many other fields. In those areas, they increasingly restrict the role of the human body to pilot, technician or repairperson – or the subject of the drone's gaze. If framed solely as technological drivers of the end of specific jobs and the creation of others, drones appear as one particularly visible form of the robotics revolution. My argument here is that what distinguishes drone capitalism from this wider transformation is the centrality of remote sensing to its generation of value. Capitalism depends on its extraction of surplus value from the labour of workers, as Marx famously pointed out. This is why "capitalists are incentivised to continually transform

the labour process" in order to "cut costs, beat out competitors, control workers, reduce turnover time, and gain market share" (Srnicek 12). Digital and automated economies are transforming labour in ways that make the relationship between activity and value increasingly difficult to see. As Franco Berardi argues, "infolabor, the provision of time for the elaboration and recombination of segments of infocommodities, takes to the extreme the tendency, which Marx analysed, for labour to become abstracted from concrete activity" (89). Once multiple abstractions are distributed in time and space by networked technologies, the connection between any individual activity and capital accumulation becomes impossible to trace. This layering of abstraction is constitutive of drone capitalism because it is precisely the work of the sensor – the drone camera, the motion detector, the foreign exchange tracker – that transforms activity in the world into data upon which another layer of extraction operates.

Yet there is, of course, much readily recognisable labour that surrounds the manufacture, operation and maintenance of drones. In this sense, drone capitalism originates from and is necessarily dependent on enduring (if increasingly automated) globalised industrial processes. According to the industry association Unmanned Vehicle Systems International, commercial drones will add 100,000 jobs in the US alone by 2025. Within the military sphere, one of the promises of drone warfare is to boost military manufacturing – although those factories are often highly automated. In the US, cities and states compete for the location of new military drone factories, while Israel, China and others compete for the sale of drones with nations racing to modernize their warfighting capacities (Benjamin 32). Within military operations themselves, the work of soldiers, technicians and support personnel is rapidly changing. In 2015, the US military trained nearly 200 Unmanned Aircraft Vehicle (UAV) pilots and is still well below target levels (Chatterjee). In recent years, small-scale drones have been issued to soldiers in the field, such as the 1.3kg Wasp and 1.9kg Raven, which are intended to limit threats through radically improved battlefield monitoring. Globally, the military drone market is pegged at $9.9 billion USD in 2017 and projected to grow to $15.2 billion by 2027 for a cumulative value of $113 billion (ReportLinker). While the military manufacture of drones was once restricted to the United States and Israel, the proliferation of drone manufacturing across the world signals both the globalisation of the military-industrial complex and its slow decentring from its American origins. Commercial and civilian uses of UAVs took off later but have expanded even more rapidly, such that the biggest drone manufacturer today is the Chinese retail drone producer DJI. As Goldman Sachs points out, the "$100 billion market opportunity we forecast over the next five years is just the tip of the iceberg. The full economic potential of drones is likely to be multiple times that number, as their ripple effects reverberate through the economy" (Goldman Sachs). And none of these figures, of course, include the wider markets for smart home devices, automated trading, and so on. Yet while the size and scope of the emerging market for unmanned aerial drones makes clear its dependence upon and integration into globalised and networked economies, drone capitalism, understood in the wider sense of value creation via autonomous remote sensors, is far more extensive.

How, then, to reconcile this familiar and material development of a new industry with the Nest Learning Thermostat and the datafication of daily life? While a brief and wide-ranging essay such as this cannot hope to comprehensively trace the similarities and differences in the role and nature of labour across such diverse fields, my wager is that this hybrid, ambivalent quality – at once material and abstract, familiar and alien, techno-affective and viscerally present – is precisely what makes drone capitalism such a potent form of relation between labour, value, capital and life. Drone capitalism is both pervasive and elusive; it manifests in the all-too-familiar expansion of corporate militarism but also in the increasingly autonomous abstraction of human activity into processable data that defines the military drone, the smart home and the spectrum of sensor-driven value accumulation between and beyond.

While one of the most enduring and seductive promises of the drone is its contribution to the end of work as we know it, what we know of late capitalism suggests that such a promise is ultimately hollow. As Richard Sennett shows in his ethnographic studies of office workers, life within the new modes of neoliberal capitalism is stressful and precarious, defined by the anxiety of ill-defined conditions of employment, indebtedness and decentred bureaucratic structures that shift responsibility from the institution to the individual (43). Even if fewer and fewer of us in the industrialised world labour in fields or factories, the fabric of our life becomes labour within the domain of drone capitalism – and the very invisibility of that relation, its insistence on alienating us from both the value of our activities and the processes by which it accumulates, persists as a site of increasing anxiety that eats away at the hope of a more just, equal, healthy, sustainable and secure world.

Space and Time

"The goal of high-frequency trading (HFT) programs, running on computer servers inside data centres," writes Donald MacKenzie, "is simply to trade profitably, ideally without accumulating too large – and therefore too risky – an inventory of the futures, shares, bonds or currencies being traded" (MacKenzie). HFT is all about sensing, speed and time. Algorithms watch specific futures or indices for tiny movements that determine whether or not to place orders, whether to buy or sell. Advantage is won or lost in the fractions of a second it takes for signals to pass down fibre-optic cables or through the air as high-frequency millimetre waves. Decisions on trading positions are not made by humans, but by super-fast computers equipped with proprietary algorithms. These algorithms leverage "differences between quote prices of the same shares across different markets as well as between equity derivatives and the underlying shares" (Hope 174). Algorithmic trading exploits differentials between one state and another as the affective dynamics of change race through the system: it aims to sense ahead of the change, to catch change in the process of changing and exploit the difference. Profit margins on each trade are often tiny – mere fractions of a cent – but traders make up for this through massive volume, often making several million trades in a day. In doing so, HFT is "dependent upon ever-

increasing trading speeds and the unending contraction of sequential time" (174). While the algorithmic technologies themselves are black boxed away from prying eyes (Seyfert), the processual relations of sensing and responding are as clear here as they are in the work of the Nest in the home. HFT is an arms race of information transfer speed: sense shifts in price fast, process actions fast, deliver orders fast. Successful profit-making can depend on reacting to the market before the market materialises on screens, while it remains in an emergent state between the execution of incoming orders and their reporting to the wider network. Alternatively, algorithms could place multiple orders without executing any of them, goosing the market with virtual trades. HFT, then, is the financial practice for an era in which power is increasingly pre-emptive, trained on emergence and the bleeding edge between virtual and actual (Massumi, *Ontopower* 56). They are the financial equivalent of the US military's "signature strikes" which use algorithmic analysis of patterns of behaviour to authorise the launch of missiles.

Successful HFT is as much a matter of geography as it is of technology. Drawing on years of interviews with HFT traders, MacKenzie argues that "the spinal cord of US capitalism … runs from Aurora, a town in Illinois that's now essentially an outer suburb of Chicago, to northern New Jersey" where the fibre optic mainline connects to Manhattan. Aurora is home to the data centre of the Chicago Mercantile Exchange, which trades futures – a legal agreement to buy or sell something at a predetermined price at a specified time. Because futures are tied to an underlying asset, they are classed as derivatives, or the abstraction of an abstraction. One of the futures that matters most is a financial product called the E-Mini, which tracks the S&P500 index. Potential shifts in the underlying value of the shares that make up the index show up first in the E-Mini, creating a fraction of a second in which tiny price differentials can be exploited by HFT algorithms. The precise positioning of millimetre microwave dishes along that spine can be the difference that makes a difference: the occupation of geophysical space enables the purest informational vector, the fastest line between one point and the next, reducing the meaningful intervals of time to the nano-second. Effective techno-affectivity depends on this overlay of physical space and even its transformation, as mountains are tunnelled and landscapes remade to accommodate fibres, dishes and lasers (MacKenzie et al.). Programs are perpetually poised to be affected by the future as it emerges, as it only just barely comes into being, but because this sensing leads to autonomous action, it is also always already affecting the future in that moment of emergence. This is the droning of high finance: automated algorithms working at speeds far in excess of human action, control over space enabling control over time, and action generated by remote sensing of price fluctuations in the midst of their occurrence.

A similar conjunction of control over relations between space, time and socio-technical assemblage is also crucial to the drone in military form (Kaplan). As I have already suggested, the military drone is perhaps the purest physical manifestation of enclosure to date. Its capacity to rapidly transform geographies and atmospheres into battlespaces is at the heart of its value proposition: what drone manufacturers sell the military is, in a very real sense, the technological power to create specific spatial and temporal zones

of incipient violence. In drone warfare, the dynamic differentials of the techno-affective become techniques of violence on the verge of happening: the complex system of the drone apparatus harnesses human and non-human processes of monitoring that are always geared towards the outbreak of violence in one form or another (Richardson). In its most lethal form, this emerges in the killbox, a cube of spatial coordinates which is opened and activated to allow combat units to fire at will. As Gregoire Chamayou puts it, "a killbox is a temporary autonomous zone of slaughter" (55). While this creation of zones of potential violence is obviously true of the totemic Predator and Reaper drones that drift with their Hellfire missiles at 10,0000 feet, the same dynamic is enabled by the micro-drones used by ground forces to infiltrate inaccessible spaces for surveillance.

Drone capitalism in its military context is equally concerned with the time and space of military work. It is now well known that lethal drones in conflict areas are operated from distant bases. In the United States, the most famous of these is Creech Air Force Base in Nevada, less than an hour outside Las Vegas. Here, drone pilots, sensor operators and analysts work 12-hour shifts in shipping containers retrofitted as Ground Control Stations for missions over Afghanistan, Pakistan, Iraq, Yemen, Somalia and elsewhere. While much of their work is dull tedium, they can be called on to launch lethal strikes on the bodies and buildings on their console screens. After their shifts, the crews drive home to partners and families and the demands of everyday life. The extreme strangeness of this arrangement has been the subject of much interest in the popular press, particularly around the question of the extent to which drone crews can suffer from PTSD and similar conditions, but also in cultural artefacts like the "serious game" *Unmanned* or the (rather mediocre) film *Drone*. What is striking, however, is the degree to which the drone collapses warfighting into the bureaucratised, managerialised office work so emblematic of late capitalism. These soldiers experience unique stressors – the call centre worker or programmer is never ordered to kill – but so much of what they do is intimately familiar to any office worker: long hours at a screen, repetitive tasks, demanding managers, constant communication, attention fragmented across multiple tasks. Labouring under regimes of self-monitoring, reporting and control, battlespace and homespace maintain only the flimsiest of distinctions as the crews shuttle back and forth — commuters to the frontline of drone capitalism.

Both the military drone and algorithmic trading assemblage share something more than the use of spatio-temporal fields of techno-affectivity: they both intimately enfold the human body. Just as the military drone operator spends long hours within the locked-down space of the Ground Control Station, surrounded by screens, interfaces and networked communications (Gusterson), so too the high-frequency trader is literally encased in screens at custom-designed workstations, watching the algorithms at work (Seyfert). As Robert Seyfert writes, automated trading "turns out to be an intensification of human and machine relations" (5) defined by processes of mutual attunement between computational system and human agent. In exactly the same way that drone warfare keeps proliferating the humans in the loop that leads to killing (pilot, sensor operator, mission commander, military lawyers,

even generals), algorithmic trading demands ever deeper entanglement with humans precisely because the algorithms are autonomous. The techno-affectivity of such systems is not simply about the tracing, monitoring and exploiting of flows of affect within the technical apparatus, but also the ways in which human-machine affective relations become increasingly intensive.

This rearrangement of relations between space, time and techno-affectivity in the accumulation of value is apparent across the various modes in which drone capitalism takes shape. Amazon's Alexa, for instance, is the dronification of the home: collating the songs you play, the products you order, the questions you ask the Internet. But Alexa learns more than you tell her, always listening, tracking and datafying your activities and desires, your affects and opinions in ways both obvious and imperceptible. Like the Nest, this commodification of the rhythms of daily life signals shifts in the nature of labour, but it also marks both an enfolding and enclosing of the once-private space and time of the home. Drone capitalism is not unique in this respect, of course, but its capacity to extract value from activity across the spectrum of life exceeds the more deliberate encroachment on private time and space by smartphones and always-on-the-clock employer expectations.

Techno-affected Bodies

Enclosure and enfoldment, space and time, labour and autonomy: the forces of drone capitalism converge and diverge in shifting fields of techno-affectivity. What, then, of the human bodies caught within its skein of networked flows and processes, apparatuses and technologies? How does drone capitalism impinge on bodily experience at scales both major and minor? What price for the human caught the flows, forces and forms of drone capitalism? These are all questions of affective relations to and with drone technology and its rippling effects – not only in the economic field, but socially, culturally, politically and, finally and most fundamentally, corporeally. At issue here is how technologies, in Marie-Luise Angerer's words, "constitute reality in its biological, physical, affective, and psychological dimensions" (25). They are also questions about the consequences of drone capitalism for bodily relation to the world as it tilts into rapid change. As Nigel Thrift writes, "*value* increasingly arises not from what is but from what is not yet but can potentially become, that is from the *pull of the future*, and from the new distributions of the sensible that can arise from that change" (31). In drone capitalism – as in all capitalism – that pull of the future comes at a price. Recognising the need for empirical research and complex variability of collective and individual experiences, I nonetheless aim to speculatively trace a handful of injurious techno-affective impingements of drone capitalism across the three domains through which this essay has already moved: security, finance and the home.

Security. In the tribal regions of Pakistan bordering Afghanistan, people describe life as permeated by anxiety, the body held equally on edge by the distant buzz of drones overhead or the threatening quiet of their absence (Bashir and Crews). For those individuals and their communities, death, injury and destruction are always on the verge of arrival; an alienating

existence beneath the enclosed sky, subject to an algorithmic fate (Chamayou 47-51). In the West, life under, with and alongside drones is more ambivalent, their affects more diffuse and uncertain. Discomforting encounters can be acute – the drone that rises above the beach or the park, that hovers outside an upstairs window with its camera tilted towards the glass – but their attendant anxieties feel less existential. Or so it seems for now: that complacency may already be dissipating with the droning of policing and domestic security already underway as practices of drone surveillance, control and capture boomerang back from war (Jensen). Policing has always been integral to enclosure, managing and accounting for its contradictions internally so as to eradicate the capacity to step outside the capitalist system (Shaw 202). But militarised policing is itself big business, force-fed by drone capitalism: weapons manufacturers adapt surveillance drones for western cities, facial recognition software is embedded in CCTV networks, and algorithmic tools enable predictive policing. In a world of ever-present threat, fuelled by the amplification, modulation and direction of fear (Massumi, "Fear"), surveillant and weaponised drones are radically ambivalent. For some, they offer reassurance, while for others – and particularly those who are racialized – it promises ever more oppressive control. This promise of security depends on continual anxiety: what else does it mean to live within the enclosing and unblinking gaze of the security drone?

Finance. In the midst of the global financial crisis of 2008, no one – neither the bankers nor the regulators – was able to accurately, reliably or even coherently value the credit default swaps, collateralised debt obligations and other structured products that had precipitated the crisis (Crotty). If those in charge couldn't grasp the fundamental processes at the centre of so much of global capital, is it any wonder that entire populations remain alienated from its workings? As the example of HFT suggests, contemporary finance is intensely automated. Money is invested in futures, indices, structured financial products and other instruments that are whole orders of abstraction removed from human labour. High-finance capitalism today is largely capitalism without bodies: abstractions that feed on abstractions, acted upon by algorithms dependent on remote sensors that hunt for fissures in the relations between price, time and information flow. As Seyfert shows, the human trader is folded into the algorithmic machine, becoming a circuit-breaker within the apparatus rather than the originator of action. In the algorithmic world of HFT, techno-affective dynamics are forces of abstraction, acting in and on the world via the chaotic profusion and unpredictable interplay of time and space, price and volume, information and action. HFT and other modes of automated finance locate themselves at the seeping edge of the virtual becoming actual, of abstraction, signal and infra-action intersecting emergently (Massumi, *Parables* 43). This is instability by design, but beyond control. Algorithmic finance feeds on uncertainty within the system, but the instability it feeds back into the network can be too much for it to handle. In the Flash Crash of 6 May 2010, HTF of certain shares saw the Down Jones twice plummet suddenly before recovering some 15 minutes later. Even though US$1 trillion was lost, experts cannot identify a consensus cause: without memory to learn from, "small, untraceable pricing anomalies and technical malfunctions will continuously generate disastrous results"

(Hope 175). Thus, the dronification of finance, its increasing reliance on automation and non-human sensation, sets it against the populous and feeds grievance, fury and frustration. From the outside, high finance is a smooth surface, inscrutable and without any place for purchase, yet its machinations convulse the ground beneath the populous and few who tend to its techno-affective machinery are ever held accountable for the ruin it wreaks. This is the paradox of drone capitalism in its financial form: its techno-affects are at once its vital energies and a threat to its existence.

Domesticity. Webbed within always-on sensor technologies, we move through homely architectures that insist on the abstraction of our bodies. This soft enfolding into the interdependent array of surveillant assemblages (Haggerty and Ericson) of global enclosure remains a background hum, only occasionally asserting itself to disconcert. Amazon suggests reading keyed to conversation from the night before, or the house is cold because the Nest expects our absence. It's all a matter of subjective experience, the affectivity of this malleable zone between convenience and discomfort. Yet whether an instance tilts positive or negative in our experience, the affective atmosphere of domestic spaces shifts in register with the arrival of drone technologies. Even as these intimate environments open onto network possibilities, so too does the body multiply into datafied abstraction. For all this visible technology, the so-called smart home feels like something that has not yet quite arrived: clumsy and incomplete, defined by its glitches and gaps in connection. In the smart home, "the building's sensors – those of its machines and architectures –and the sensory faculties of the inhabitants are cross-wired in complex ways that are prone … to disruption, or problems of translations may arise between technological and organic sensing" (Angerer 46). To occupy such a space is to be aware of the drone's hum, its ambivalent status in relation to the human. Affects swirl, but they don't always land cleanly: an atmosphere, a milieu. Drone capitalism arrives in the home only to complicate the body, to widen the register of intimate atmospheres from the personal to the technological. On the clock, in the home, doing work that once was simply life. Yet does the shift register? Or are we already too enfolded and enclosed to take note of just how techno-affected we already are?

Drone capitalism's techno-affectivity flow in multiple directions and concatenates multiple fields. Not only are our bodies affected by the droning of different dimensions of experience, but drone capitalism targets affect for absorption, abstraction and control. As media technologies, drones are concerned both with capturing activity through vision and data and with controlling human activity. This is, as Richard Grusin notes, constitutive of "the ways in which media function on the one hand to discipline, control, contain, manage or govern human affectivity and its affiliated things 'from above,' at the same time that they work to enable particular forms of human action, particularly collective expressions or formations of human affect 'from below'" (79). The paradox of drone capitalism is that it depends on the visceral corporeality of human bodies, on their liveliness and variety and activity, even as it insists on their mediation into data and situates them in a position of anxious yet complacent alienation. The droning of the world feels inevitable and the very complexity of the affective atmosphere into which the

drone intervenes – national security, the automation of work, big data, and so on – makes traction for resistance difficult. Affective atmospheres, writes Ben Anderson, hold a "series of opposites – presence and absence, materiality and ideality, definite and indefinite, singularity and generality – in a relation of tension" (80). In this sense, drone capitalism shares much with capitalist realism's "pervasive *atmosphere*, conditioning not only the production of culture but also the regulation of work and education and acting as a kind of invisible barrier constraining thought and action" (Fisher 16, emphasis in the original). Like the smooth surfaces of automated finance, drone capitalism deflates popular resistance through its ubiquity, technicity and abstraction.

Drone capitalism is as affective as it is material, defined by its merger of remote sensing and autonomous action with the extraction of value via abstractions of life, space and labour. As such, drone capitalism describes an array of emergent conjunctions of flows, forms and forces within late neoliberal techno-capitalism. While the extent to which it will come to define contemporary capitalism as a whole remains unclear, drone capitalism's strange and estranging dynamics of autonomous and semi-autonomous remote sensing technologies and techno-affective dynamics are expanding, infiltrating and reshaping the production and accumulation of value at an exponential rate. Commenting on the work of Paolo Virno, Grusin notes that "capitalism takes different forms in a control society, that it appropriates or exploits or 'capitalises' on the dynamic energies of general intellect or affective labour" (77). In a similar vein, Fisher argues that "to a degree unprecedented in any other social system, capitalism both feeds on and reproduces the moods of populations" (Fisher 35). Drone capitalism extends this absorption, appropriation, exploitation and reproduction of affect, mood and emotion into the domain of remote sensing and autonomous labour – a domain already constituted by the techno-affective distribution of difference, potential and incipient change. In this essay, I have propositionally traced its imbrication across security, finance and the home, but its processes extend beyond these domains and seem certain to expand with the continued proliferation of autonomous, remote sensing technologies of all forms. The question for the publics and persons gripped by anger or unease, then, might well be how its techno-affects might be remodulated and repurposed to provide some mode of resistance to its tendency to enclose and enfold life. It will not be an easy task.

Acknowledgments

I am most grateful for the two incisive anonymous reviews of this article, for the thoughtful engagements with the material by the audience at the Cultural Studies Association of Australasia Conference 2018 and for the ongoing conversations with my friends and colleagues Collin Chua and Andrew Murphie that have helped shape this paper. All remaining oddities and flaws in this essay are, of course, my own.

Works Cited

Anderson, Ben. "Affective Atmospheres." *Emotion, Space and Society* 2.2 (2009): 77–81. doi:10.1016/j.emospa.2009.08.005.

Andrejevic, Mark. "Surveillance in the Digital Enclosure." *The Communication Review* 10.4 (Dec. 2000): pp. 295–317. *Crossref*, doi:10.1080/10714420701715365.

---. "Theorizing Drones and Droning Theory." *Drones and Unmanned Aerial Systems*. Ed. Aleš Završnik, Springer, 2015.

Angerer, Marie-Luise. *Ecology of Affect: Intensive Milieus and Contingent Encounters*. Translated by Gerrit Jackson, Meson Press, 2017.

Bashir, Shazad, and Robert D. Crews. *Under the Drones: Modern Lives in the Afghanistan-Pakistan Borderlands*. Harvard University Press, 2012.

Benjamin, Medea. *Drone Warfare: Killing by Remote Control*. 2013.

Berardi, Franco Bifo. *After the Future*. Ed. Gary Genosko and Nicholas Thoburn, AK Press, 2011.

Bogost, Ian. "Hyperemployment, or the Exhausting Work of the Technology User." *The Atlantic*, Nov. 2013. *The Atlantic*. https://www.theatlantic.com/technology/archive/2013/11/hyperemployment-or-the-exhausting-work-of-the-technology-user/281149/.

Carroll, Robert. *God's Eye News: The Use of Drones in Journalism, a Documentary Film*. ProQuest Dissertations Publishing, 2015. *primoa.library.unsw.edu.au*. http://search.proquest.com/docview/1728152515/.

Chamayou, Grégoire. *Drone Theory*. Trans. Janet Lloyd. Penguin, 2015.

Chatterjee, Pratap. "Are Pilots Deserting Washington's Remote-Control War?" *Huffington Post*, 5 Mar. 2015. https://www.huffingtonpost.com/pratap-chatterjee/are-pilots-deserting-washingtons-remote-war_b_6808634.html.

Christiansen, Steen Ledet. *Drone Age Cinema: Action Film and Sensory Assault*. I.B. Tauris, 2017.

Crotty, J. "Structural Causes of the Global Financial Crisis: A Critical Assessment of the 'New Financial Architecture.'" *Cambridge Journal of Economics* 33.4 (July 2009): 563–80. *Crossref*. doi:10.1093/cje/bep023.

Dean, Jodi. *Democracy and Other Neoliberal Fantasies: Communicative Capitalism and Left Politics*. Duke University Press, 2009.

---. *Publicity's Secret: How Technoculture Capitalizes on Democracy*. Cornell University Press, 2002.

Deleuze, Gilles, and Felix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*. Trans. Brian Massumi, University of Minnesota Press, 1987.

Fisher, Mark. *Capitalist Realism: Is There No Alternative?* Zero Books, 2009.

Goldman Sachs. "Drones: Reporting for Work." *Goldman Sachs*, http://www.goldmansachs.com/our-thinking/technology-driving-innovation/drones/.

Gregg, Melissa, and Gregory J. Seigworth. "An Inventory of Shimmers." *The Affect Theory Reader*. Ed. Melissa Gregg and Gregory J. Seigworth, Duke University Press, 2010. 1–25.

Grusin, Richard. *Premediation: Affect and Mediality after 9/11*. Palgrave Macmillan, 2010.

Gusterson, Hugh. *Drone: Remote Control Warfare*. MIT Press, 2016.

Haggerty, Kevin D., and Richard V. Ericson. "The Surveillant Assemblage." *British Journal of Sociology* 51 (2000): 605–22. doi: 10.1080/00071310020015280.

Hardt, Michael, and Antonio Negri. *Empire*. Harvard University Press, 2000.

Hodkinson, Stuart. "The New Urban Enclosures." *City* 16.5 (Oct. 2012): 500–18. *Taylor and Francis+NEJM*. doi:10.1080/13604813.2012.709403.

Hope, Wayne. *Time, Communication and Global Capitalism*. Palgrave Macmillan, 2016.

Jensen, Ole B. "New 'Foucauldian Boomerangs': Drones and Urban Surveillance." *Surveillance & Society* 14.1 (2016): 20–33.

Kaplan, Caren. "Drone-o-Rama: Troubling the Temporal and Spatial Logics of Distance Warfare." *Life in the Age of Drone Warfare*. Ed. Lisa Parks and Caren Kaplan, Duke University Press, 2017. 161–94.

Krishna, K. R. *Push Button Agriculture: Robotics, Drones, Satellite-Guided Soil and Crop Management*. Apple Academic Press, 2016.

Linebaugh, Peter. *Stop, Thief! The Commons, Enclosures and Resistance*. PM Press, 2014.

MacKenzie, Donald. "Be Grateful for Drizzle." *London Review of Books* 36.17 (Sept. 2014): 27–30.

---. "Drilling Through the Allegheny Mountains." *Journal of Cultural Economy* 5. 3 (Aug. 2012) 279–96. *Taylor and Francis+NEJM*. doi:10.1080/17530350.2012.674963.

Massumi, Brian. "Fear (the Spectrum Said)." *Positions: East Asia Cultures Critique*13 (Spring 2005): 31–48.

---. *Ontopower: War, Powers, and the State of Perception*. Duke University Press, 2015.

---. *Parables for the Virtual: Movement, Affect, Sensation*. Duke University Press, 2002.

---. "The Autonomy of Affect." *Cultural Critique* (1995): 83–109. doi:10.2307/1354446.

---. *The Power at the End of the Economy*. Duke University Press, 2015.

Murphie, Andrew. "On Being Affected: Feeling in the Folding of Multiple Catastrophes." *Cultural Studies* 32.1 (Jan. 2018): 18–42. *Taylor and Francis+NEJM*. doi:10.1080/09502386.2017.1394340.

Nest. "Meet the Nest Learning Thermostat." *Nest*. https://www.nest.com/thermostats/nest-learning-thermostat/overview/.

Poster, Mark. *Information Please: Culture and Politics in the Age of Digital Machines*. Duke University Press, 2006.

---. *The Mode of Information: Poststructuralism and Social Context*. Polity Press, 1990.

ReportLinker. *The Global Military UAV Market 2017-2027*. Oct. 2017. https://www.reportlinker.com/p04647023/The-Global-Military-UAV-Market.html.

Richardson, Michael. "Drone's-Eye View: Affect Witnessing and Technicities of Perception." *Image Testimonies: Witnessing in Times of Social Media*. Ed. Kerstin Schankweiler and Verena Straub, Routledge, forthcoming.

Sennett, Richard. *The Culture of the New Capitalism*. Yale University Press, 2007.

Seyfert, Robert. "Automation and Affect: A Study of Algorithmic Trading." *Affect in Relation – Families, Places, Technologies. Essays on Affectivity and Subject Formation in the 21th Century*. Ed. Jan Slaby and Birgitt Röttger-Rössler, Routledge, forthcoming.

Shaw, Ian G. R. *Predator Empire : Drone Warfare and Full Spectrum Dominance*. Minneapolis: University of Minnesota Press, 2016.

Slaby, Jan, and Rainer Mühlhoff. "Affect." *Affective Societies – Key Concepts*. Ed. Jan Slaby and Christian von Scheve, Routledge, forthcoming.

Srnicek, Nick. *Platform Capitalism*. Polity, 2016.

Terranova, Tiziana. "Free Labor." *Digital Labor: The Internet as Playground and Factory*. Ed. Trebor Scholz, Routledge, 2013. 33–57.

Thrift, Nigel. *Non-Representational Theory : Space, Politics, Affect*. 1st ed., Taylor and Francis, 2008.

UAS International. *Saving Time Saves Lives: Medi-Drones Set for Take-Off*. UAS International, 2017.

Vukov, Tamara, and Mimi Sheller. "Border Work: Surveillant Assemblages, Virtual Fences, and Tactical Counter-Media." *Social Semiotics* 23. 2 (Apr. 2013): 225–41. doi:10.1080/10350330.2013.777592.

Wajcman, Judy. *Pressed for Time: The Acceleration of Life in Digital Capitalism*. University of Chicago Press, 2016.