Technology and moral vacuums in just war theorising

(accepted version)

Elke Schwarz

University of Leicester

es304@leicester.ac.uk

Abstract

Our contemporary condition is deeply infused with scientific-technological rationales. These influence and shape our ethical reasoning on war, including the moral status of civilians and the moral choices available to us. In this article, I discuss how technology shapes and directs the moral choices available to us by setting parameters for moral deliberation. I argue that technology is an *actant* of moral significance to just war thinking, yet this is often overlooked in attempts to assess who is liable to harm in war and to what extent. This omission produces an undue deference to technological authority, reducing combatants, civilians, and scenarios to data points. If we are to develop a maximally restrictive framework for harming civilians in war, which I think should be a goal of just war thinking, then it is imperative that the scientific-technological dimension of contemporary war is given due attention.

Keywords

Just war theory; ethics of war, ethics of technology, applied ethics

Introduction

On July 7th, 2016, former army reservist Micah Xavier Johnson opened fire on police officers in Dallas, killing five and wounding an additional nine officers. The shooter was subsequently chased by responding officers and eventually cornered in a college building where a two-hour long standoff ensued. During this time Johnson threatened to shoot anyone in his path, growing increasingly erratic and manic. As efforts to negotiate Johnson's surrender seemed to deteriorate, the Dallas Police Department resorted to unusual measures: it sent in a lethal robot. Dallas Police Chief David Brown ordered two officers to mount a load of C-4 explosives on a bomb-disposal robot, which the police department had acquired a few months prior, sent the loaded charge in to where Johnson was holed up, and remotely detonated the robot bomb once it had reached its target. Shooter Johnson died from the blast. Dallas Police Chief David Brown insisted that the action taken was necessary to avoid more officers getting harmed: 'We had no choice, in my mind, but to use all tools necessary' (Chan, 2016). The case attracted much attention in the media and within academic circles for its unusual use of remote control technology and the high level of force applied to take out an attacker. A key concern raised was what the moral implications of the use of remotely operated lethal technology by the police might be. More pointedly, might the availability of such technology somehow serve to 'reframe our perceptions of what is "necessary" when it comes to the projection of lethal force' (Ian Kerr, quoted in Lin, 2016)?

The Dallas PD's use of explosives and their delivery-by-robot raises important questions about the use of lethal force and the role of technology in directing our moral deliberations.¹ In particular, it should give us pause to consider how we relate to technology in our ethical thinking and, more concretely, how new technologies of killing might shape our thinking through moral choices. This question of technology is relevant not only to the future direction of police work, but also to warfare. While the use of remotely administered lethal force in a police context is seen as redrawing the boundaries of law enforcement in possibly significant ways, the practice has become normalised in warfare through the use of weaponised unmanned systems, more

¹ The use of a bomb to end a stand off is not unprecedented in the United States. In 1985, a Philadelphia police helicopter dropped a bomb on a house, which had been occupied by a group of armed radicals. The bomb was allegedly the final means to end the siege, after using fire hoses, gunfire and tear gas. The bomb killed most of the adults and children in the house at that time and caused a series of fires to adjacent houses, destroying 65 in total. It has widely been condemned as a morally unjustifiable act.

commonly known as ‘drones’. The worry – in policing as in war – is, that remotely administered technological force opens up a vacuum in law and policy, which ‘has the potential to lead to overuse of machines that can be used to injure or kill suspects’ (Sullivan, Jackman and Fung, 2016). As societies and militaries become ever more technologically sophisticated, enabling (lethal) force to be deployed from greater distances and with fewer risks to the parties in possession of such technologies, it becomes necessary to examine the technological condition that underwrites contemporary moral dilemmas in thinking through the permissibility of harm in war. It is to this task that I turn my attention in this article. Against a background of ongoing debates about the ethical implications of using unmanned aerial vehicles to kill terror suspects and the moral implications of autonomous lethal weapons system, I examine whether technologically sophisticated weapons systems direct or impact our moral deliberations. My core argument is that advanced technologies of violence influence moral decision-making in ways that are significant to just war thinking but often remain neglected. This in turn risks producing vacuums for moral decision-making about inflicting harm in war.

I begin by spotlighting the moral significance of technology in discussions about the permissibility of violence, arguing that technology shapes our moral decision making in ways that are significant to just war thinking but rarely acknowledged. To do this I consider both the hypothetical cases advanced in (revisionist) just war theory and the real world cases presented by technologically mediated conflict today. More specifically, I draw attention to how the seemingly unproblematic presence of different tools of harm in analytical case scenarios can shape intuitions and perceptions about when it is morally permissible to harm others. I then discuss how the use of drones for lethal strikes in the war on terrorism constitutes a technology that recasts the elasticity of criteria such as ‘necessity’ and ‘imminence’ in ways that alter moral deliberations, shifting focus toward moral calculation and technological risk management, for which technology provides a crucial authority. Finally, and following on from this, I critique approaches to ethical thinking and practice that prioritise moral calculus and risk management, arguing that these methods for finding ‘correct’ moral solutions are embedded within and informed by a techno-scientific logos, which, in fact, limits the possibility for moral discernment and therefore moral responsibility. My position is that thinking about the permissibility of harm and the ethics of war requires a reflexive approach to our own situatedness within and

relation to technology, and that such an approach should be geared toward a maximally restrictive, not permissive, framework of harm.

Before I proceed with the argument, however, a brief detour is required. When assessing the permissibility of harm, an understanding of the endogenous attributes of war and violence is important, for it enables one to better evaluate what goods might be achieved through harm. In particular, it is crucial that we acknowledge the temporal structure of war and the instrumental character of political violence. These two parameters are conceptually related. The basic premise of war is that it is a socio-political activity, set against specific and plural contexts, underwritten by history, ideology, culture, and other factors. It neither draws in its remit a limited number of individuals, nor does it offer a finite set of possible outcomes. Rather, war as an activity constitutes complex relations between governmental elites, combatants, and civilians. War as an event is often multi-causal, and typically sets off a chain of interrelated and often unexpected events, affecting multiple parties that are to greater and lesser extents voluntary or informed participants in the activities of war. The continuous rather than discrete time of contemporary wars requires an analytical lens that does not see war as a contest with game-like rules and structures, in which finite rounds of strategic decisions determine a clear winner. The oft-referred metaphor of the chess game as a referent for practices and strategies in war is therefore misleading. This is evidenced in particular by the protracted nature of conflicts associated with the “war on terrorism”, which problematise the notion of war as a strategic game. Contra Clausewitz, a war against ideologically defined ‘enemy concepts’ is not very likely to ‘carry the power of its own enforcement’ (Scarry, 1985: 98). Instead, such wars necessitate perpetual full-spectrum policing to maintain a level of dominance and control. The nature of violence as a political tool is instrumental to this dynamic.

War’s primary concern is to inflict harm to enemy property, enemy bodies, or, in most cases, both. Violence is thus an instrumental feature of war. Recall that war is a political activity. We can conclude then that violence (harm) is used instrumentally in order to achieve certain political goals. The instrumentality of violence in war is, however, by no means straightforward, and rests on the often uncritically accepted axiom of violence-as-politics. To better understand what violence can and cannot achieve in and for politics, a closer look at the properties of violence is required. In order to do this, I draw briefly on Hannah Arendt’s short essay, *On Violence*. The

nature of violence bears three core characteristics for Arendt: (1) it is instrumental; (2) it is the polar opposite to power; and (3) it is inherently anti-political. The instrumental nature of violence permits its use only in situations of self-defense and struggle against oppression. In other words, violence can wreck a political wrong or spoil a wrongful attack. However, the inability of violence to create lasting political power makes violence unfit as a tool to realise political outcomes, or ends. Where violence might be temporarily instrumental for achieving the short-term goal of disrupting a specific group of known terrorists, for example, it cannot achieve the long-term outcome, or end, of creating a future free from terrorism. For Arendt, the nature of violence is such that it contains within itself a capricious contingency that disallows any constitution of political certainty. But when violence is misunderstood as a useful way of achieving political outcomes, the practice of violence may well become a political condition. Arendt warns: 'the danger of violence, even if it moves consciously within a non- extremist framework of short-term goals, will always be that the means overwhelm the end' (Arendt, 1970: 80). Here, it is worth quoting her at length:

Violence, being instrumental in nature, is rational to the extent that it is effective in reaching the end that must justify it. And since when we act we never know with any certainty the eventual consequence of what we are doing, violence can remain rational only if it pursues short-term goals ... If goals are not achieved rapidly, the result will be not merely defeat but the introduction of the practice of violence in the whole body politic. (Arendt, 1970: 79-80)

In short, the nature of violence is such that it can be instrumental only to attain an immediate good. This is broadly in keeping with many of the thought experiments on self-defense and harm that seek to evaluate the permissibility of harm in extreme situations that require a swift decision. However, if we consider the nature and temporal structure of contemporary war, the matter of violence as a morally justifiable tool to obtain a good becomes more complicated. The danger is that the means may overwhelm the end; that goals become ends. This is relevant for the revisionist school of just war thinking in two ways. First, it makes the political context more relevant to deliberations of harm than revisionist thinking may want to accept. Second, if, as Helen Frowe (2015) notes, 'the only thing that can give moral justification for harming is the moral value of the goal', then we must be very clear about what is a

political goal and what is a political end. The problem is exacerbated when violent technologies remain unchallenged as rational means for political ends. Reflexive deliberations regarding the ethics of war should give scrutiny to the ‘what’ and ‘how’ of theorising, in order to validate their relevance and understand how theory may shape practice. I have briefly addressed the context (war) and the acts (harm) above. In what follows, I will discuss the mode (science/technology).

Technology matters: Flamethrowers and other gadgets in moral theorising

In our age, technology influences almost all spheres of human life. This is by no means a new insight; the histories of humanity and technology are deeply entwined. Technologised societies are governed by a “rational apparatus” in which ‘combining utmost expediency with utmost convenience, saving time and energy, removing waste, adapting all means to the end, anticipating consequences, [and] sustaining calculability and security’ have become the master mandates of political administration (Marcuse, 1982: 142). Everywhere, one encounters ‘the conviction that we simply must have technology, that we must have ‘better’ technology, and that we must have ever more of it’ (Babich, 2013: 44). Nonetheless, the pace of technological change and the increasing influence of technology in everyday and military life demand that we are attentive to its social power. In the context of just war thinking, technology matters in a number of ways. It prompts us to consider proportionality and discrimination *in bello*, and it increases the speed and efficacy of our actions. As it is the case with autonomous and automated weapons systems, new technologies produce new scenarios with hitherto unexplored moral dilemmas. And technologies sometimes inadvertently produce ‘solutions’ for morally complex situations in war.

Take, for example, Gerhard Øverland’s (2014) discussion of moral obstacles. Øverland’s position is that those innocently in the path of a defensive action by someone who is impermissibly attacked, bear a certain cost by their sheer presence – they become moral obstacles. Consequently, the constraint against harming moral obstacles should be reduced. He begins his analysis with the case *Flamethrower*. In this scenario

Tom impermissibly attacks Mary and some people standing around her with

lethal means. The only way Mary can save herself and those around her is by killing Tom with a flamethrower. Behind Tom is a house with people in it. If Mary uses her flamethrower, she will kill the people in the house. (Øverland, 2014: 484)

Øverland posits that the permissibility of Mary using her flamethrower and killing the occupants of the house depends on the how many people would die and how many would be saved. In this case, the cost of the destructive range of the technology at hand is assigned to the people in the house, who become ‘moral obstacles’, despite the fact that the availability of the flamethrower as a specific means of action is entirely invented by the thought experiment. My aim here is not to take issue with Øverland’s argument about moral obstacles; rather, it is to bring the moral significance of the technology at hand into the deliberation. If Mary had a poison dart rather than a flamethrower, the people in the house would not incur the additional cost imposed by the flamethrower. The moral significance of the bystanders in the *Flamethrower* scenario arises only because Mary has chosen the flamethrower as a tool with which to defend herself and the others. The consequences of using the flamethrower will inadvertently be different than the consequences of using a poison dart, a ray gun, a microwave pain ray system, a remote-controlled device equipped with C-4, or a team of experienced negotiators to talk Tom down. This much is perhaps self-evident. What is notable in Øverland’s argument, however, is that the additional cost incurred by the extended *capabilities* of a particular technology is assigned to the bystanders – a cost that could otherwise be seen to reside within the choice of the weapon. At work here is a risk transfer to which the technology contributes, but that is obscured when technology is taken as a seemingly unproblematic entity in thinking through the parameters of moral calculations. This is, in principle, applicable to any technology, new or old. But as our technological capacities become increasingly sophisticated, greater in reach and more autonomous in decision-making capabilities, it is worthwhile asking how our interactions with technology might shape how we perceive, or intuit, the parameters of the moral choices we face.

This is particularly relevant in the real world, where ‘the only option’ is rarely just that. A failure to acknowledge the moral significance of choosing technological means might make some means that are not necessarily justified

seem justified; it might make means that are not absolutely necessary *seem* necessary, and it might make technological tools that for whatever reason appear to be the most attractive option in a collection of available options seem like the *only* option. The point here is not that technological means produce entirely new moral choices, but that they carry the potential to obscure aspects of moral decision-making and thereby enable justifications for potentially greater harm. This is the worry raised earlier in the case of the robot bomb in the Dallas shooting. That case, in abstract terms, seems straightforward: The police administered lethal force in self-defence, and the remotely controlled bomb was ostensibly the only means available to do so.

However, the claim of necessity for using such unusual and forceful measures is problematised by the fact that the use of the robot created a distance between the police officers and the shooter that effectively puts the officers out of harms way. Consequently, as Patrick Lin (2016) observes, ‘in theory, less risk to their lives means less reasons to kill a suspect’, thus presenting a considerable challenge for the justification of self-defence based on imminent harm. This would suggest that factors other than absolute necessity or a lack of other choices might have determined the selection of means for the actions taken in the Dallas case. Rather, it would indicate that the availability and expediency of this particular technology was influential in justifying such extreme means.

These lines of argument will sound familiar to those actively engaged in debates on the ethics of lethal drones, where the use of remotely controlled weapons for targeted killings of terrorist suspects continues to be a hotly contested issue. Is the use of lethal force justified when there is no imminent danger but a possibly foreseeable danger to people’s lives? Does the technology promote violent practices over non-violent actions? Do they expand or contract the number of innocent deaths? Do they ‘work’? And so on. This is not the time and place to engage with these very important questions. For the purpose of this discussion, however, I would like to stress that unlike any other weapons system unmanned aerial vehicles, or drones, are claimed to be *inherently ethical* instruments for killing by their advocates.² This particular moral framing should matter for any just war theorist and analyst, and invites us to critical evaluate the drone’s capabilities and use, particularly when instrument and practice are so closely linked.

² Bradley J. Strawser is one of many who have made the controversial case for the moral necessity of drones. See also Brennan (2012), Anderson (2013), Carney (2013), Lee (2013) and Statman (2015). This position remains highly contested (see, for example, Chamayou, 2015)

I ask elsewhere how drone technology itself might shape our understanding of ethics and our capacity to think ethically [*citation omitted*]. This applies for a range of technologies of violence and should give us pause for thought. The argument I wish to make – that technology matters for just war thinking – rests on the acceptance that material objects, specifically those employed as instruments, have qualities that exceed those of ‘passive tools in the hands of those that use them’ (Leander, 2013: 816). Specifically, technology can ‘authorise, make possible, encourage, make available, allow, suggest, influence, hinder, prohibit and so on’ (Latour, 2005: 104). This is true specifically for technologies of harm, and the drone is a case in point.

How technology matters: The case of the drone

Drones offer a visual technology that enables the collection of data, facilitates diagnostic analysis, and is able to administer a course of action in specific situations of conflict with minimal risk to the operators overseeing the use of the technology. These particular attributes have the capacity to alter moral calculations in at least three ways. First, they prioritise combatants’ preservation by making possible the elimination of a threat to fellow soldiers from a remote position, as a form of defensive killing (Chamayou, 2015: 131-134). Second, they shift temporal horizons for moral calculations. And third, they produce a technologically determined moral authority that problematises discrimination and narrows the possibility for moral contestation. In what follows, I will briefly highlight three ways in which drone technology shapes the moral choices available in war.

Self-preservation of combatants

The use of lethal drones enables a self-preservation practice that prioritises the integrity and safety of the unit, if need be, over civilian safety. Consider, for example, the U.S. Standing Rules of Engagement, which state ‘unit commanders always retain the inherent right and obligation to exercise unit self-defense in response to a hostile act or demonstrated hostile intent’ (CJCS, 2005). Hostile intent is defined here as ‘the threat of imminent force against the United States, US forces or other designated persons or property’, whereby ‘imminent’ ‘does not necessarily mean

immediate or instantaneous' (CJCS, 2005). Now, consider Strawser's Principle of Unnecessary Risk (PUR), which suggests 'it is wrong to command someone to take on unnecessary, potentially lethal risk in an effort to carry out a just action for some good' (Strawser, 2010: 344). Drones, according to Strawser, constitute the ideal instrument for the possibility of PUR, and are therefore 'ethically obligatory' (Strawser, 2010: 343). This is a troublesome position that falls prey to an unreflective acceptance of the ostensibly unproblematic character of the drone as a technology of killing. In what follows, I briefly address how technology can indeed shift the parameters of moral calculus in any one given situation of self-defence.

The problem that presents itself here is a variant of the *Flamethrower* or indeed the Dallas PD scenario. If a unit identifies demonstrated hostile intent, and all possible actions are taken into consideration to do what is necessary for the self-defence of the unit, then PUR would necessitate a prioritisation of the use of a drone over the use of other means that pose greater risks to the unit in peril, even if this means that a small number of civilians might be harmed. This risk transfer from combatants to civilians in warfare is something that has been clearly observed in the US drone war. The foundation for this logic rests on the assertion that military lives matter just as much, if not indeed more, than civilian lives in warfare (Chamayou 2015: 131). More so still if the technology available to solve the "risk problem" is deemed inherently virtuous, and the combatants consider themselves *just* vis-à-vis an *unjust* enemy population.³ The USAF MQ-9 Reaper badge, which reads 'that others may die' and features the image of a grim reaper is emblematic of the risk transfer ethos. Arguably, this could apply to any distancing technology (including regular airpower), which holds the promise to reduce risk for combatants. However, there appears to be something particularly seductive about drone technology. A component of this may reside in its political economy. Following Strawser, the obligation to use drones also rests, in part, on the fact that they are inexpensive and preserve scarce military resources. On this view, the limits to self-defence may well be determined not by proportionality but 'by the means available to protect one's rights' (Coons and Weber, 2016: 4) whereby the most efficient means to self-defence is

³ I purposely leave aside the issue of just-unjust combatant status, but it exacerbates the problem I seek to highlight. If just combatants consider themselves 'civilians in uniform', the threshold to use distancing technology is, in my view, lowered. I leave the designation aside because 'just' and 'unjust' are categories that cannot be attributed to parties in current conflicts in any unproblematic way.

increasingly confused with the only way to self-defence. The necessity of a specific type of force for self-defence thus becomes a cost calculation as a stand in for an ethical deliberation. In such calculations of utility, the value of civilian life appears to have diminishing currency.

Diminished temporal horizons

The second way in which attributes of drone technology might recast the criteria for moral deliberation links in with the point made above, and relates to the altered temporal horizons generated by the drone. Temporal horizons are particularly crucial to discussions of imminence and pre-emption/prevention. The spatial-visual capacities of drone surveillance, paired with the possibility for swift lethal actions (as is the case with an MQ-9 Reaper, for example) may serve to diminish perceived horizons for action, and thereby limit the horizon for moral deliberation. A possible threat likely to materialise in an unknown future time may be interpreted as an imminent threat, providing justification for immediate eliminative action. This is, of course, the justification rationale that underwrites the US drone campaign in the war on terrorism.

Consider the following: Military X is conducting a capture mission to apprehend terror suspect Y (a national of country X) in a specific civilian location (L) in a non-hostile country P. P has given consent to the capture mission and has ground troops ready to support the mission. X tracks suspect Y's movements with an MQ-9 Reaper, operated from a military station in X's country. The surveillance footage shows that another person, Z (a national of country P), in location L is preparing what looks like a suicide vest, which could kill 80 civilians if used in a highly populated area in P. There are also un-identified persons A and B in the location. The MQ-9 Reaper's payload includes four hellfire missiles with which Z could be eliminated, along with Y, A, and B. This action would also kill at least 3 civilians, two of them children. The calculation pressed into a space of imminence is now this: Is it permissible to accept the certain death of three civilians in order to prevent the possible threat to a maximum of 80 civilians at an unknown time in the future? Such a question shows how a possible threat that is expected to materialise at an unknown future time may be interpreted as an imminent threat and turned into justification for immediate lethal action, provided the tools to do so are at hand. In

other words, it shows how the very parameters of necessity and imminence can change. A similar scenario unfolds in Gavin Hood's 2016 film *Eye in the Sky*, which delicately highlights the moral space that technological capacity opens up between legal and political uncertainty. Here, again, the technology is pivotal in shaping decision-making practices and moving moral questioning into a predominantly cost-calculative realm.

This diminished horizon between moral evaluation and eliminative action is entirely eclipsed once autonomous 'shoot-to-kill' technologies are introduced into the picture. Such technologies provide even more effective and less costly ways of administering lethal force than drones. Autonomous border control technologies, as employed by Israel and South Korea are a case in point. The basic premises implicit in these systems are first, that the technological means is just, and second, that the target is liable to be killed, based on pre-specified moral parameters. The 'moral calculus' takes place *ex ante* and is then applied to a range of given contexts in any given moment of decision. The authority for the moral decision is thus immanent to the machine. This brings me to my final and most important point about how technology alters the parameters of moral calculations: technology itself, can exert an authoritative impact on moral thinking.

Techno-authority

The technological capacity of lethal unmanned systems considerably challenges the sensory and evaluative authority of the human 'in the loop'.⁴ This is not exclusive to drone technology but is characteristic of new technological systems in war across the board. The productive mechanism at work here fits the human into the visual and computational logics of the drone system, whereby the technology offers its human operators 'super human' capacities. It produces an enhanced, improved, extended, sober, and ostensibly neutral version of human vision. Drones far exceed the sensory capacities human in the task of war in a number of ways – from endurance (drones don't blink, neither do they need to consider pilot fatigue), to data collection and analysis (vast scopes of data can be captured and processed). This, paired with the ostensible capacity for greater precision, renders the drone not an instrument but a sanitised guide in the practice of killing. Set against a background where the

⁴ Citation removed.

instrument is characterised as inherently wise, the technology gives an air of dispassionate professionalism and a sense of moral certainty to the messy business of war. The essence of this techno-authority resides in the interconnected systems of technological professionalism and morality. The human drone operator is wired into a technical ethical universe; a universe that relies solely on scientific processes and algorithmic logics to identify correct ethical solutions. The problem here is two-fold. First, the drone can only execute a limited range of actions vis-à-vis a suspect (survey, pursue, or kill). A suspect cannot surrender, or persuade the technology of their non-liability to harm. Second, where ethics becomes a technical matter, it must prioritise those moral aspects that can be quantified. I expand on this point below.

In the case of drones, the human still makes the decision to pull the trigger on targeted killings. However, the algorithmic rationale immanent to processes of targeted killing through remote weapons reflects a techno-subjectivity where ostensibly ethical decision-making is arrived at purely through data. Take, for example, the ongoing practice of signature strikes. Signature strikes target unknown persons based on an algorithmic identification of behavioral patterns and other markers, such as age and gender. Targets for elimination are selected by way of algorithmic risk profiling on the basis of preconceived ideas of what is perceived to be a likely threat in the future. Again, the superior capacities of the drone system (surveillance, sharp visuals, extensive data capture) summon the perception that patterns of normality (benign) and abnormality (malign) can be clearly identified. This is then fortified with other algorithmic data analysis programmes (SKYNET, for example), which in turn serve as a justification for the ‘legitimate’ killing of persons who have, quite possibly, done nothing to make themselves liable to lethal harm. As Gregoire Chamayou (2015: 146) points out, the capacity of the technology to identify targets, along with the implicit ethicality of the instrument, is precisely what allows the ethical focus to be subverted into a pure game of numbers, whereby ‘the suspect is guilty until proven innocent – which, however, can only be done posthumously’. It will be evident to all but the most technologically hardened ethicist that this, by practice, cannot truly satisfy the requirements of just killing. Rather, it strikes me that here the means overwhelm the end. The ascertainment of liability to harm through technology is problematic not only with drone strikes, but also needs to be considered in the wider context of contemporary and future technologies of war.

Techno-subjectivity in contemporary rationales for war

Technologies inform and feed into the streamlined logos and ethics of contemporary war as computable. This is the 'sci-tech' lens, which has been advanced by US military engagements since the Vietnam war. Beginning with that particular conflict, 'formal and mechanical modelling provided the categories and techniques by which the Americans understood themselves and the enemy' (Coker, 2008: 38). The sci-tech lens draws on different fields of knowledge and practice, ranging from mathematical models, systems analysis, gaming, and cybernetics, using these to inform war strategy at the most elite of levels. Such an approach to war truncates 'experiential and situated knowledge', along with everything else that cannot be rendered in quantifiable or calculative terms (Coker, 2008: 40). The upshot is a prioritisation and privileging of the quantifiable aspect in and of war. This scientific-technological perspective also underwrites much of the revisionist just war thinking, to which turn here.

The obsession with discrete numbers in deliberating the permissibility of harm to civilians (number of deaths are often the focus here), and the fixation with data (the bigger the better!) reflects this priority. Technologies for identifying potential collateral damage estimates are a crucial tool in assessing the incidental killing of civilians, helping to ensure that campaigns may stay within legal and normatively accepted bounds. However, the methodological rationale is often a matter of form over substance. Technological authority is pivotal in this process. In her dynamic analysis of necessity in just war reasoning, Neta Crawford highlights precisely this point:

The technical analysis is used to help decision makers stay within the law, but it may also serve to excuse decisions that we might otherwise believe were wrong and to defuse the moral responsibility for actions. The moral tension between military necessity, and discrimination and proportionality are not eliminated, but they are smoothed by the use of technical analysis. In a sense, some amount of authority over *jus in bello* was ceded to the military, then to military lawyers, is then ceded to technical analysis and a form of computer-assisted expertise. (Crawford, 2013: 233)

In other words, the technological capacity factors in as a superior calculative information provider, which is ostensibly neutral in character. But of course, technologies such as SKYNET or CDE technologies are by no mean infallible in securing correct outcomes, particularly when they are partnered with a sense of urgency (such as FAST CD 2.0, for example). This condition is obscure, however, when the algorithms on which forecasts and predictions are based carry an implicit bias, a condition that is not uncommon in learning algorithms (Floridi et al., 2016: 7). Furthermore, Technology, like the humans that produce the technology, can fail – yet the authority of a technologically determined course of action is powerful. In his exploration on surveillance and predictive policing systems, Kevin Miller highlights the uncritical trust placed in computer-based systems. He notes:

In decision-systems, study after study across numerous disciplines has confirmed the phenomenon of ‘automation bias [that] occurs in decision-making, because humans have a tendency to disregard or not search for contradictory information in light of a computer-generated solution that is accepted as correct’. (Miller, 2014: 122)

This applies not only to purely automated decision-systems, but also to ‘mixed-mode’ system where a human is in the loop to review the decisions. His point is that even though there are humans in the process, there is little chance of errors being reduced or challenged once a decision has been made. This effectively makes the contestation of an unethical algorithmic calculation highly problematic. To be diligent in our moral analysis, this condition needs attention in deciding, strategically, where the limitations for the infliction of harm are to be set.

The human element in new weapons systems is thus embedded within a technolocos, to which they tailors their actions, intentionally and unintentionally. The technolocos at work here may correspond well to purely calculable aspects of moral reasoning – consequentialist calculations of utility, for instance. But they cannot address dimensions of moral reasoning that exceed a purely analytical cost-benefit analysis. To be diligent in our moral analysis, we must take this condition into consideration before we can ascribe augmented rights to technologically sophisticated societies to inflict lethal or non-lethal harm. This matters, specifically for moral deliberations in an imagined future where technological capacities are limitless as the

content of moral reasoning risks falling prey to a form of moral reasoning that disregards its own technological focus.

Technologies of moral calculation

An authority of scientific-technological expertise is increasingly relevant in moral considerations of weakened constraints against harm. To illustrate this more clearly, I want to draw on Jeff McMahan's *Future Killer Case*. The scenario is thus:

We discover a rare combination of genes whose possessors have a greater than ninety-nine percent probability of becoming serial killers, even after they have been subjected to the most effective forms of psychiatric and pharmaceutical therapy. This gene combination is identified in a child of five who has been brought in for testing by his parents because he already shows a morbid fascination with serial killers, torments animals, bullies his playmates, keeps a collection of animal bones, and so on. Yet so far he has committed no actual criminal offense. (McMahan, 2006: 176)

The question raised here is whether the child is liable to preventive action? This, of course, is an extreme case of both medical and statistical certainty and rightly constitutes an exception. Nonetheless, it offers an interesting and relevant framework for contemplation, given the practices outlined above and in light of existing technologies that seek to forecast harmful intentions. In McMahan's scenario, the ascertainment of potential danger rests on the possibility of technological certainty. Here, the 99% probability, which has been ascertained somehow, renders the constraints against harming the innocent child weakened. Here, the consequences that have not yet materialised, but are technologically forecast, are weighted against the preventive harm to an individual. McMahan's assessment is that, based on the forecast, it is necessary and therefore permissible to lock the child away. In other words, constraints against harm to the child are '*overridden*' by the necessity of protecting the innocent' from some harm in a temporally unspecified future (McMahan, 2006: 177). Furthermore, he notes, if the '*only* effective way to prevent the child from killing innocent people was to kill him, then killing [him] might be

proportionate' (McMahan, 2006: 177). The baseline determinant for this moral calculus is the scientific-technological condition of gene-testing and forecasting technologies. McMahan considers that the application of such moral reasoning is not likely to succeed in practice; intentions are mental processes and first and foremost inaccessible to others. This makes the probability of ascertaining who needs to be put away highly undependable, and thus the moral calculus for future harm equally difficult – Unless, of course, 'we possessed an *intentionometer* that would infallibly detect other people's intentions and gauge their strength' (McMahan, 2006: 185). This, he claims, would significantly impact on the moral and legal status of preventive defence.

The logic of resting moral calculations on scientific-technological parameters is precisely what informs programmes like the Future Attribute Screening Technology (FAST) and SKYNET. FAST is a U.S. Department of Homeland Security (DHS) project, which is designed to 'quickly and objectively screen individuals for malintent' (DHS, 2016). The programme gathers physiological and behavioral data (such as raised heart rate, body temperature, facial patterns, eye movements, body language, and other cues) through non-contact sensors, and then remotely analyzes whether someone might be inclined to intend to 'cause harm to [...] citizens or infrastructure' (DHS, 2016). The DHS insists that the programme is objective in its gender, culture, and age- neutrality. Similarly, NSA's SKYNET collects, mines, and analyzes pattern-of-life data, communications data from mobile phones, social network information, and travel behavior to create a profile based on vast amounts of meta-data, which is then used to discover or reveal potential terror suspects. This entails a strong belief in the epistemic power of data itself, as NSA Counsel Steward Baker admits: 'If you have enough metadata, you don't really need content' (quoted in Cole, 2014). Former NSA Director General Hayden goes even further: 'We kill people based on metadata' (quoted in Cole, 2014). Aside from the fact that the non- consensual collection of data through surveillance and non-contact sensors raises considerable privacy issues, the role technology plays here in translating '*probable* associations between people or objects into *actionable* security decisions' raises moral questions that require us to challenge the basis of the technology as an ethical authority (Amoore, 2009: 52).

The idea that mathematics and scientific judgment might tame contingency and uncertainty is evident not only in the real world, but also in the *Future Killer*

Case. Here, technology is assumed to be neutral in assessing the probability for future harm, and therefore serves as the authority in determining whether there is a weakened claim for an individual to not be harmed. There are two obvious problems here: false positives and implicit bias. Predictive programmes are not 100% accurate. With a probability threshold of 99% in the *Future Killer Case*, one could argue that the child who falls into the 1% error margin may just have to accept the cost for the wider good of society. With technologies that are claimed to be 71-83% accurate, like FAST, the margin becomes wider, and more individuals that are not liable to preventive harm will have to bear the burden through false positives. We find ourselves once more with an ethical puzzle that only asks the question: what is the right ratio? This peculiar utilitarian/consequentialist calculation amounts to little more than moral risk management and is, in fact, unable to address the moral vacuum that is raised through the use of the technology.

The reliability of current technologies for predicting future scenarios is highly contested, with wildly buoyant assessments for accuracy rates (Grothoff and Porup, 2016) and a disputed premise for the analysis – namely that ‘there is an identifiable physiological signature uniquely associated with malicious intent’ (Stephen Aftergood, quoted in Weinberger 2011). This takes me to the second problem with the techno-authoritative basis for moral calculations, which is that the algorithms used in the identification of a malign pathology (in medicine as much as in fighting terrorism) are rarely value free. As algorithms determine ever-greater realms of decision-making and with Artificial Intelligence making rapid advancements, scholarship on the ‘normativity of information technologies in general and algorithm development in particular is growing’ (Floridi et al, 2016: 7). Across the board, this scholarship shows that how an algorithm functions and how it is trained reflects the values and principles of its intended uses and its designers. In other words, the values of the algorithm’s designer are ‘frozen into the code, effectively institutionalizing those values’, deliberately or not (Macnish, 2012: 158). As such, algorithms are already heavily value-laden and may well, in some cases, designed to reflect certain values. This makes sense when we consider that algorithms must first be fed with sufficient relevant data in order to have predictive capacity (‘ground truths’) and be trained to adapt. However, the data needed to do either may not be available in sufficiently large numbers (reliable data and meta-data on known terrorists, for example), and data for algorithm learning might be taken from an inappropriate or

biased sample. In other words, basing predictive analysis models on infrequent events, insufficient data, or inappropriate data is likely to lead to an increase in false alarms (Curtis, 2016: 528). Algorithms are rarely neutral. Neither is technology. They regularly reflect the aims and intentions of their makers and normalise their position and priorities (values). They also alleviate decision-makers from moral responsibility by offering scientific- technological authority for judgment. Moreover, when perceived as ‘trustworthy independent of (or perhaps even despite) any trust in the data processor’ (Floridi et al., 2016: 8), they are likely to shrink horizons for moral decision-making.

The technological implications highlighted above are indicative, but by no means exhaustive, of the moral significance of technologies of war in just war thinking. They are, however, illustrative of the influence they have on parameters of moral decision- making. Signature strikes pose a challenge for principles of discrimination, as well as distinctions between foreseeable civilian deaths versus intentional civilian deaths. Predictive and preventive technologies subvert categories of proportionality, expected ‘good’, and necessity. New kinds of human-machine interfaces, autonomous weapons technologies, and neuro-scientific advances into the manipulation of brain processes are likely to further disorder neat categories of intentionality and necessity, and ultimately pose a problem for ideas of moral responsibility in just war thinking by altering the temporal horizons of war.

Moral vacuums in calculative ethics

Following on from the discussion above, it is clear that technology is itself normatively charged, and if it is taken for granted as an authoritative source of moral parameters, it renders actors themselves less able to engage in moral deliberation. Take, for example, Bradley Strawser’s attempt to resolve the issue of determining liability in real world contexts by devising the notion of Reasonably Perceived Liability (RPL), a conflict-by-conflict assessment of who is liable to harm and to what degree. Combatant and non-combatants could, according to this plan, be ranked numerically whereby level 1 combatants, for example, may be most liable to harm (i.e., may be killed), and level 3 combatants least liable to be harmed. The same could apply for non-combatants. The epistemology for the levels of liability suggested is somewhat vague. The onus would fall to the just force to ‘research the evidence available to

an enemy populace and the various options for them to take in their support or non-support of an unjust cause', and levels of moral deliberation among enemy combatants and civilians would have to be ascertained (Strawser, 2013: 80). However this would be done, the idea is that RPL could assist forces in minimising their own moral risk.

Strawser's RPL framework to some degree addresses the various and complex roles that combatants and non-combatants take on in war, and makes for an interesting proposal. However, if we recall the levels of delegation to technology that characterise contemporary war, the authority for assessment of levels of liability would likely rest on a combination of calculative and predictive technological systems, which *then* inform ROE. In any given situation, then, a soldier, informed by the framework's categories, need not consider the moral permissibility of whether a specific combatant may be killed. If the combatant already has been categorised as RPL level 1, she can be executed without further deliberation. The ethical decision is relegated to the programme, *prior* to the moment of decision. The soldier implements a 'programme' but makes no moral decision – ergo, no moral risk is incurred.

What I wish to highlight here is the moral vacuum that technologies of ethical decision-making create in their quest to 'secure' moral risk. A moral vacuum opens when certain parameters of harm are no one's responsibility; when the decision that harm is permissible has been determined through technological means. This moment is, paradoxically, also the very moment of moral responsibility. In other words, the moral vacuum exists exactly in the moment when neither law nor existing moral guides have adequate reach. It is in this moment where responsibility resides. For example, the moral vacuum opens precisely when a specific signature strike is executed. Here the decision to kill someone has been determined by algorithms that feed into a disposition matrix and determine whether an individual's pattern of life analysis betrays terroristic dispositions. The accuracy of the technologically determined kill decision cannot be easily (if at all) verified. Where, then, resides responsibility? The moral vacuum also opens out onto us when Mary selects the flamethrower in the understanding that it is permissible to harm Mo, because he is a moral obstacle and because principles of self-defence may render her choice of weapon justified. The unique moral demands of each context remain, however, intact, and so does the responsibility for one's actions in a morally

challenging situation. The onus is (or should be) on Mary still as she has to consider how the context of the specific situation in which she finds herself shapes what is morally permissible for her to do, and her responsibility for her chosen course of action remains. This includes responsibility for harming or killing innocent persons. Hypothetical cases such as the Flamethrower case are problematic in their quest to find the right principle to determine when an innocent person may be harmed. The high level of abstraction obscures the messy reality to which it aims to apply. This is exacerbated when technology is instrumentalised without being problematised for moral deliberations. And it is here that the techno-logical foundations of abstracting moral principles from hypothetical scenarios are most clearly revealed.

Where ethics prioritises finding the correct principles for correct solutions to moral problems ethics is understood as something that can be solved and secured once the right ethical principles have been identified and put in place, enabling moral risk to be minimised. Such an approach reveals a scientific-technological mind-set that seems prevalent in contemporary just war theorising. Moral analysis-as-risk management renders ethics a purely technical matter – a problem that can be solved through processes of abstraction and optimisation. Technology-as-ethics and ethics-as-technics go hand in hand: both rely on an abstraction of possible scenarios and factors, which fit into a technical framework that purports to ascertain best-possible outcomes through calculation. The language and form of moral analysis is indicative. Often we use the language of ‘cost’, ‘duty’, ‘benefits’, ‘obstacles’, and ‘expected value’, all of which resemble the technical vocabulary of the economist. And in many cases, this language is paired with the tools of computational syntax, such that moral dilemmas are expressed as abstract problems to which definitive solutions are to be found.⁵ Such an econometric approach is likely to make moral reasoning unintelligible to all but the most technically inclined of experts. This in turn produces a reliance on ethical certainty produced through the authority of moral experts, and risks promoting moral atrophy among those that seek ethical guidance *only* in the views of such experts. It does not require a leap of the imagination to consider that, if algebra or statistics are the true form of moral reasoning, then moral reasoning is something best done by a computer rather than a human. Such forays into ‘machine ethics’ are well underway in recent the discussions of automated weapons systems.

⁵ The work of Seth Lazar, Yitzak Benbaji, and Bradley Strawser, for example, employs such structures of computational reasoning in moral deliberation.

This approach to just war thinking can only hold if we accept that, as Jeff McMahan suggests, moral philosophy, or ethics, works ‘like a science’, whereby the working material is ‘purified’ into neat categories of variables that are independently assessed through algorithmic logics and scientific hypothesising, such that ‘authoritative judgments’ about conflicts can be reached (McMahan 2013).

The idea of ethics-as-science is highly contested. Most important in the context of war, however, is that the stated aim of this approach is hampered by its own structure (which carries an implicit bias toward technical analysis). It must, by virtue of its scientific-technical format, truncate all those aspects relevant to war and violence that either cannot be easily captured in discrete calculable terms, or that are deemed irrelevant as a factor to consider. The multiple numerical values possible for the different levels of harm incurred to civilian populations in war are clearly too multiple to fit into an ethical formula as described above (how do you ‘measure’ the loss of a limb, the loss of a family member, trauma, and so on?). Thus, moral reasoning that relies on analytic abstractions and technologically streamlined understandings of war *do not* have the capacity to address those morally significant factors that fall beyond the domain of what can be ascertained numerically (i.e., beyond the trolley problem of how many people can permissibly be killed and how they can be killed to save some others), despite even the greatest of efforts for an accurate cost-benefit analysis.

In focusing in on selected aspects of a situation, so that universal principles may be uncovered, other relational principles, specific to a scenario or event, may well be missed. This matters for war. It also risks, as Kim Hutchings (2015) notes, that the ethical theorist may become “unreflective about his or her own relationship to the moral content in relation to war”, paying more attention to the logical structure of the argument than the moral content of its object. In such instances, technical abstraction delimits our understanding of the conditions in which we theorise. Here, I am reminded of Arendt’s (1977: 177) assessment on form over substance in moral reasoning: “what people get used to is less the content of the rules ... than the possession of rules, under which to subsume particulars”.

Concluding thoughts

With the above, I suggest that socio-political factors may influence our moral

deliberations in ways that are not immediately obvious but nonetheless relevant. I hope to have shown that our interactions with technologies shape our moral decision-making in ways that are significant to just war thinking, but often under-examined. Given the rapid development of new technological means of waging war and the many ways in which these may recast criteria for moral deliberation, a reflexive approach to our modes and forms of ethical reasoning might be helpful to better identify new moral problems and responsibilities. The danger is always that everything looks like a nail when you have a hammer, and we must be careful not to implicitly adopt this position when engaged in just war thinking, particularly in a context where the categories of 'just' and 'unjust' are increasingly unclear. As Vivienne Jabri (2016: 209) points out: 'Conceptual choices have implications not just for what they enable hermeneutically, but also for what they enable in the world of practice'. Just war thinking carries a responsibility for precisely such real world implications.

As we move forward in the drive to further automate decisions as to who is liable to be killed, this technological context poses ethical questions of the highest order. Where drone technology is the beginning of such processes, autonomous weapons system and systems of Artificial Intelligence will be the next step in encoding categories of 'right' and 'wrong' into lethal machines that operate on efficiency and utility maximisation principles. With a growing focus on algorithmically determined calculable outcomes, the danger is that we lose sight of the important social dimensions of warfare and making peace. The question is: how do we reflexively adjust our moral thinking to this technological condition, before ascribing an augmented right to technologically advanced societies to inflict (non-lethal) harm? In this, finding ways to harness our technological condition, and working towards positive moral outcomes of harm in warfare is important. For such a task, the guiding question is not 'what can I justifiably do to the other?' but rather, 'what is my responsibility to the other?'

References

Amoore L, (2009) Algorithmic war: Everyday geographies of the war on terror. *Antipode* 41(1): 49-69.

Anderson K (2013) Drones are ethical and effective. Speech given to the Oxford Union, 25 April 2013. Available at:

http://www.youtube.com/watch?v=G99A8LAKnaU&feature=youtube_gdata_player/ (accessed 6 April 2017).

Arendt H (1970) *On Violence*. Orlando: Harcourt, Brace and Company.

Arendt H (1977) *Life of the Mind*. New York: Harcourt, Brace and Jovanovich Publishers.

Babich B (2013) *O Superman!* Or being towards transhumanism: Martin Heidegger, Gunther Anders, and media aesthetics. *Divinatio* 36 (2013): 41-99.

Brennan J (2012) The efficacy and ethics of the President's counterterrorism strategy. Speech delivered at the Wilson Center, Washington DC, 30 April 2012. Transcript available at: <http://www.wilsoncenter.org/event/the-efficacy-and-ethics-us-counterterrorism-strategy/> (accessed 6 April 2017).

Carney J (2013) Speech given to the White House press corps, 5 February 2013. Video available at:

http://www.youtube.com/watch?v=Gg8jPheXtas&feature=youtube_gdata_player/ (accessed 6 April 2017).

Chairman of the Joint Chiefs of Staff (2013) Instr. 3121.01B, Standing Rules of Engagement for the Use of Force, 13 June 2005. Available at:

https://www.loc.gov/rr/frd/Military_Law/pdf/OLH_2015_Ch5.pdf/ (accessed 6 April 2017).

Chamayou G (2015) *A Theory of the Drone*. New York: The New Press.

Chan M (2016) Dallas Police Chief defends use of 'bomb robot' to kill suspected sniper. *Time*, 10 July 2016. Available at: <http://time.com/4400148/dallas-police-chief-bomb-robot/> (accessed 6 April 2017).

Coker C (2008) *Ethics and War in the 21st Century*. London: Routledge.

Cole D (2014) We kill people based on metadata. *The New York Review of Books*, 10 May 2014. Available at: <http://www.nybooks.com/daily/2014/05/10/we-kill-people-based-metadata/> (accessed 6 April 2017).

Coons C and Weber M (2016) *The Ethics of Self-Defense*. New York: Oxford University Press.

Crawford NC (2013) Bugsplat: US standing rules of engagement, international humanitarian law, military necessity and noncombatant immunity. In: Lang AF, O'Driscoll C and Williams J (eds) *Just War: Authority, Tradition and Practice*. Washington: Georgetown University Press.

Curtis N (2016) The explication of the social: Algorithms, drones and (counter-) terror. *Journal of Sociology* 52 (2): 522-536.

DHS Science and Technology Directorate (2016) Future Attribute Screening: Technology Fact Sheet. Department of Homeland Security, 2 March 2016. Available at: <https://www.dhs.gov/publication/future-attribute-screening-technology/> (accessed 6 April 2017).

- Floridi, L, Mittelstadt BD, Allo P, Taddeo M and Wachter S (2016) The ethics of algorithms: Mapping the debate. *Big Data & Society* 3 (2): 1-21.
- Frowe H (2015) The 2014 Gaza war: Was Operation Protective edge a just war? *The Critique*, 1 April 201. Available at: <http://www.thecritique.com/articles/was-the-2014-israeli-operation-protective-edge-a-just-war/> (accessed 6 April 2017).
- Grothoff C and Porup JM (2016) The NSA's SKYNET program may be killing thousands of innocent people. *ARS Technica UK*, 16 February 2016. Available at: <http://arstechnica.co.uk/security/2016/02/the-nsas-skynet-program-may-be-killing-thousands-of-innocent-people/> (accessed 6 April 2017).
- Hood G (2015) *Eye in the Sky*. Drama
- Hutchings K (2015) War and moral stupidity: Feminism contra cosmopolitanism. Paper presented at the European International Studies Association conference, 23-25 September 2015, Sicily, Italy.
- Jabri V (2016) Late modern wars and category errors. *Security Dialogue* 47(3): 208-214.
- Latour B (2005) *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: Oxford University Press.
- Leander A (2013) Technological agency in the co-constitution of legal expertise and the US drone program. *Leiden Journal of International Law* 26(4): 811-831.
- Lee P (2013) Debate: Is the use of unmanned military drones ethical or criminal? *The Guardian*, 2 December 2013. Available at: <http://www.theguardian.com/commentisfree/video/2013/dec/02/unmanned-military-drones-battle-ethical-video-debate/> (accessed 6 April 2017).
- Lin P (2016) Should the police have robot suicide bombers? *IEEE Spectrum*, 11 July 2016, Available at: <http://spectrum.ieee.org/autoton/robotics/military-robots/should-the-police-have-robot-suicidebombers/> (accessed 6 April 2017).
- Macnish K (2012) Unblinking eye: The ethics of automating surveillance. *Ethics and Information Technology* 14 (2): 151 – 167.
- Marcuse H (1982) Some social implications of modern technology. In: *The Essential Frankfurt School Reader*, New York: Continuum International Publishing Group.
- McMahan J (2006) Preventive war and the killing of the innocent. In: Rodin D and Sorabji R (eds) *Ethics and World Politics: Shared Problems in Different Traditions*. Hants: Ashgate.
- McMahan J (2013) Where to Now for Just War Theory? The Oxford Institute for Ethics, Law and Armed Conflict. Recording 02/04/2013.
- Miller K, (2014) Total surveillance, big data and predictive crime technology: Privacy's perfect storm, *Journal of Technology of Law and Policy*, 19: 105-46.

Øverland G (2014) Moral obstacles: An alternative to the doctrine of double effect. *Ethics* 124(3): 481-506.

Scarry E (1985), *The Body in Pain: The Making and Unmaking of the World*. New York: Oxford University Press.

Statman D (2015) Drones and robots: On the changing practice of warfare. In: Lazar S and Frowe H (eds) *The Oxford Handbook of Ethics and War*. Oxford: Oxford University Press.

Strawser BJ (2010) Moral predators: The duty to employ uninhabited aerial vehicles. *Journal of Military Ethics* 9(4): 342-368.

Strawser BJ (2013) Revisionist just war theory and the real world: Just war theory in the 21st century. In: Allhoff F, Evans NG and Henschke A (eds) *Routledge Handbook of Ethics and War*. New York: Routledge.

Sullivan K, Jackman T and Fung B (2016) Dallas police used a robot to kill: What does that mean for the future of police robots? *The Washington Post*, 21 July 2016. Available at: https://www.washingtonpost.com/national/dallas-police-used-a-robot-to-kill-what-does-that-mean-for-the-future-of-police-robots/2016/07/20/32ee114e-4a84-11e6-bdb9-701687974517_story.html?utm_term=.62248fccf09b/ (accessed 6 April 2017).

Weinberger S (2011) Terrorist 'pre-crime' detector field tested in United States. *Nature*, 27 May 2011. Available at: <http://www.nature.com/news/2011/110527/full/news.2011.323.html/> (accessed 6 April 2017).