Double Elevation:

Autonomous Weapons and the Search for an Irreducible Law of War

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Abstract

What should be the role of law in response to the spread of Artificial Intelligence in war? Fuelled by both public and private investment, military technology is accelerating towards increasingly autonomous weapons, as well as the merging of humans and machines. Contrary to much of the contemporary debate, this is not a paradigm change; it is the intensification of a central feature in the relationship between technology and war: double elevation, above one's enemy and above oneself. Elevation above one's enemy aspires to spatial, moral and civilizational distance. Elevation above oneself reflects a belief in rational improvement that sees humanity as the cause of inhumanity and de-humanization as our best chance for humanization. The distance of double elevation is served by the mechanization of judgement. To the extent that judgement is seen as reducible to algorithm, law becomes the handmaiden of mechanization. In response, neither a focus on questions of compatibility nor a call for a 'ban on killer robots' help in articulating a meaningful role for law. Instead, I argue that we should turn to a long-standing philosophical critique of artificial intelligence, which highlights not the threat of omniscience, but that of impoverished intelligence. Therefore, if there is to be a meaningful role for law in resisting double elevation, it should be law encompassing subjectivity, emotion and imagination, law irreducible to algorithm, a law of war that appreciates situated judgement in the wielding of violence for the collective.

Keywords

Law of war; autonomous weapons; artificial intelligence; judgement; irreducible law

1. Introduction

We are experiencing an escalation of both hope and angst in relation to the socially transformative role of technology. Artificial intelligence is gradually colonising our daily lives as well as our perception of the future. Technological advance informs both the material and economic relations in society, with added investment through the public and private sectors,[1] as well as pervasive intellectual and moral soul-searching. Attitudes range

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from extreme optimism,[2] or at least utopian engagement,[3] to a range of voices and scholarship highlighting dangers or warning against a catastrophe.[4]

In war, the above spectrum of stances on technology as a whole is both mirrored and intensified. Attitudes range from wild optimism about human perfectibility and the overcoming of human fallibility through artificial intelligence[5] through pragmatic and productive adaptability[6] to serious concerns about the de-humanization of war-fighting and the removal of the human beings from the proverbial loop.[7]

The wild swings of technological optimism and pessimism have pedigree. From the biblical figure of the Golem[8] and Hephaistos' robots[9] to Goethe's sorcerer's apprentice, man has fretted over the emancipation of his mechanical creations and the loss of control over his reified wishes, while striving to both physically and intellectually perfect and overcome his humanity through technology.[10] Angst over the brave new world of robots, and its effect on the social,[11] is a recurring affliction.[12]

Now, a prodigious multi-disciplinary literature reckons with artificial intelligence, war and law, and specifically the development and deployment of what are referred to as increasingly, and eventually fully, "autonomous" weapons. Editorials abound, campaigns

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1 A. Campolo *et al*, AI Now 2017 Report, available at https://ainowinstitute.org/AI_Now_2017_Report.pdf; V. Boulanin, 'Mapping the Innovation Ecosystem Driving the Advance of Autonomy in Weapon Systems' *SIPRI Working Paper*, December 2016, 4 on DARPA's outsourcing to private companies and Russia, China and Japan emulating.

2 R. Kurzweil, *The Singularity is Near: When Humans Transcend Biology* (2005). See also the illuminating and entertaining reporting in M. O'Connell, *To Be a Machine: Adventures among Cyborgs, Utopians, Hackers, and the Futurists Solving the Modest Problem of Death* (2017).

3 N. Srnicek and A. Williams, *Demand full automation: Postcapitalism and a World without Work* (2016).

4 N. Bostrom, *Superintelligence: Paths, Dangers, Strategies* (2014).

5 R. C. Arkin, *Governing Lethal Behavior in Autonomous Systems* (2009)

6 K. Anderson and M. Waxman, 'Law and ethics for autonomous weapons systems: why a ban won't work and how the laws of war can', (2013) *Stanford University, The Hoover Institution (Jean Perkins Task Force on National Security and Law Essay Series)*

7 See, for example, Human Rights Watch, 'Losing Humanity: The Case Against Killer Robots', 19 November 2012, available at www.hrw.org/report/2012/11/19/losing-humanity/case-against-killer-robots;; P. Asaro, 'On banning autonomous weapons systems: human rights, automation and the dehumanization of lethal decision-making', (2012) 94 *International Review of the Red Cross*, 687.

8 See E. Thorstensen, 'Creating Golems: Uses of Golem Stories in the Ethics of Technologies' (2017) 11(2) *NanoEthics* 153.

9 S. Vasileiadou, D.Kalligeropoulos, 'Myth, theory and technology of automatic control in ancient Greece', Proceedings of the European Control Conference 2007 Kos, Greece, (July 2-5, 2007).

10 O'Connell, *supra* note 2.

11 Ibid, 104-7 on the etymology of the term 'robot' and Karel Capek's 1921 play *R.U.R.* (Rossum's Universal Robots).

12 Fears of the effects of automation on the job market have featured, for example, in the covers of *Der Spiegel* magazine in March 1964, April 1978 and September 2016.

are launched to 'stop killer robots',[13] and states assemble to debate their regulation and very existence.[14]

This article intervenes in a rather crowded debate. Why is there such a flurry of current interest in autonomous weapons and their legal regulation? A visceral reaction to the idea of mechanised killing, combined with the perception of the acceleration of artificial intelligence research[15] may be a sufficient answer. The anticipation of incoming practical problems to-be-solved, questions posed by powerful interested parties, may also be an incentive for lawyers to place their analyses in the marketplace of ideas.

But I believe there is more to it. The present is the time to imagine the future, especially when one is both propelled by and unmoored from the past. The mix of artificial intelligence, war and law draws some of its headiness from a specific historical moment – a culmination of and a departure from enlightenment rationalism; the apex of progress and the moment when we fear it will get out of hand. 'The end of the end of history'[16] marks a daunting beginning.

The law of war carries this tension, with respect to both the articulation of rules and their enforcement. The legal institution of war rests on the survival of a soldier's individual sense of humanity at the time when his life is laid out for the collective. So does individual (criminal) liability: without that assumption –without that fiction – it makes no sense. I argue that the increasing mechanisation of warfare pursues the creation of distance from our enemies and from ourselves and reduces the knowledge and intelligence of the law and its application through individual judgement. I further argue that legal research on new weapons technology should focus less on questions of compatibility between given legal rules and the algorithmic and kinetic features of new weapons, as most current scholarship does, and more on an understanding of law as non-reducible to algorithmic engineering.

I start, in section 2, by reviewing the state of the art-in-the-making. Rather than providing an exhaustive taxonomy I aim to highlight the teleological nature of Artificial Intelligence research and the industry's investment in the dialectic of increasing machine autonomy and human/machine merging, or 'merged heteronomy'. I then see, in section 3, this relationship between technology and war in some historical perspective, with a view to discerning functions relevant to law. I argue that the role of technology in war entails a double elevation: above one's enemy and above oneself. The elevation above one's enemy,

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13 See https://www.stopkillerrobots.org

14 See, on the 2018 meeting of the Group of Government Experts, established by 2016 Fifth Review Conference of the High Contracting Parties to the Convention on Certain Conventional Weapons (CCW), and related documents, https://www.unog.ch/80256EE600585943/(httpPages)/7C335E71DFCB29D1C1258243003E8724?OpenDocument.

15 See the profile and interview of Nick Bostrom in R Khatchadourian, 'The Doomsday Invention: Will artificial intelligence bring us utopia or destruction?' 23 November 2015, *The New Yorker* suggesting the pace of research has especially accelerated in the last six year.

16 G. Simpson, '*The end of the end of history: some epitaphs for liberalism',* (2016) 15(1) *Baltic Journal of International Law* 332-43.

discussed in section 3.1, serves a both offensive and defensive impetus and aspires to both spatial and moral/civilizational distance. The elevation above oneself, discussed in section 3.2, is for self-perfection. It is often associated with a certain understanding of Cartesian dualism and a belief in rational improvement that may see humanity as the cause of *in*humanity and de-humanization as our best chance for humanization. It seeks to mechanize judgement and therefore establish a distance from human failings. It is served by war as governance from a distance and by the increasing physical and cognitive merging of humans and machines. Both physically and, to some extent, in moral and civilizational terms, technology and automation promise such improvement through establishing a distance from the human – our human enemy and our human self. The establishment of this distance entails a decreasing role for human judgement and the weakening of responsibility for such judgement. I further argue, in section 3.3, that law, or certain strands of mainstream jurisprudence, are complicit in such mechanization, to the extent that law is treated as logic even conceivably reducible to algorithm. And that the reaction against this process of distancing and de-humanization, to the extent that it idealises the proscriptive or regulatory role of law, is bound to disappoint.

Finally, in section 4, I aim to begin articulating what the role of law, and legal scholarship, should be in response. I argue that, while responding to a justified angst, the calls for a ban are unlikely to succeed and may miss the target. I turn to long-standing philosophical and sociological critiques which starkly show the limitations of the cognitive theory underpinning Artificial Intelligence, its disembodied poverty. I argue, and conclude, that if there is to be a meaningful role for law and if we are not to mechanize and outsource our judgement we need to work towards an irreducible and situated understanding of the law of war, one that entails the appreciation of subjectivity and emotion, a law that cannot be coded.

2. Towards full autonomy and merged heteronomy

2.1 Defining technology in escalation

This is an analysis of the present development of future technology. As such, it can be based on two parameters: the first is the observation of the trajectory of technological development, from the (recent) past to the present, including the present projections of technological expertise; the second relates to 'our beliefs about what it means to be a human being in that future.'[17] In this case as well, and if '[a]rmaments embody fantasies of future conflicts',[18] the discussion of the future is a discussion of the present – our present beliefs, understanding and projections on humanity and war-fighting. Accordingly, an

17 G. Noll, 'Weaponising neurotechnology: International humanitarian law and the loss of language', (2014) 2(2) *London Review of International Law* 201, at 204.

18 Ibid 204. See also L. Suchman, *Human-Machine Reconfigurations: Plans and Situated Actions* (2007) at 1: 'cultural conceptions have material effects'.

analysis confined to finding or setting out conditions for 'compatibility' of future technology with present law or, conversely, arguing for the 'adaptability' of present law to encompass future technology, would be insufficient for both present and future purposes. To the extent that new weapons technologies reflect an on-going trend in technology, law and war, and to the extent that they constitute a qualitative leap, discussing them without critically assessing our present categories would be a crucial opportunity lost. Law and technology are in dialogue, in a relationship of mutual influence, and this is an already long and established relationship. An argument on the relationship between law and future technology, therefore, while appreciating projected material change, needs to be primarily an argument for the present and how to change, for the future, what is already here.

Weapons technology is described in escalation towards an ultimate end: full autonomy. Teleological categorisation is applies, for example, to the qualities of 'adaptiveness'[19] or 'self-governance'[20] and is reflected in the terminology used. At one end, the term 'automatic' describes mechanical response to sensory input, without the ability to adapt to changes in the environment. One step further, the possibility to adapt, but alongside 'a pre-defined set of rules' towards an outcome, is seen to describe 'automated' weapons. Finally, an autonomous weapon, or system, 'is capable of understanding higher-level intent or direction…deciding a course of action, from a number of alternatives, without depending on human oversight or control, although these may still be present. Although the overall activity of an autonomous [system] will be predictable, individual actions may not be.'[21] The idea of autonomy dominates the analysis of weapons technology and its evolution.

The increase in the autonomy of weapons is usually perceived as corresponding to the concomitant decrease of the role of individuals. The terminology of the human/machine command and control relationship accordingly ranges from the semi-autonomous or human *in* the loop (where human input is *required* during the weapons' operation), through supervised autonomy or human *on* the loop (where an individual can intervene when something goes wrong), to fully autonomous or human *out of* the loop. Here the weapons systems 'operate completely on their own and […] humans are not in a position to intervene'.[22] Noel Sharkey has set out the level of the individual's involvement in a useful – and widely used – five-part categorisation, which illustrates the combination of increasing weapon emancipation with decreasing human participation:

1. Human engages with and selects target and initiates any attack;
2. Program suggests alternative targets and human chooses which to attack;

19 See G. Sartor and A. Omicini, 'The autonomy of technological systems and responsibilities for their use' in N. Bhuta *et al*, *Autonomous Weapons Systems: Law, Ethics, Policy* (2016), 39, at 49: 'an autonomous system must have the capacity to modify itself in order to better align its behaviour to its intended purposes in the context in which it operates.'

20 '[T]he degree of autonomy is often measured by relating the degree at which the environment can be varied to the mean time between failures, and other factors indicative of robot performance.' S. Thrun, 'Toward a framework for human-robot interaction', (2004) 19(1) *Human-Computer Interaction*, 9–24, at 14.

21 D. Mindell, *Our Robots, Ourselves: Robotics and the Myths of Autonomy* (2015), at 12.

22 V. Boulanin 'Mapping the Development of Autonomy in Weapon Systems: A Primer on Autonomy' *SIPRI Working Paper*, December 2016, at 12.

3. Program selects target and human must approve before attack;
4. Program selects target and human has restricted time to veto;
5. Program selects target and initiates attack without human involvement.[23]

The evolution of autonomy is piecemeal, a process of filling in gaps, an increasing accumulation of different skills towards full functional and operational autonomy. In the meantime, it is possible for a weapon to have full autonomy in terms of identifying and engaging a target but no autonomy in kinetic terms. Within a specific task, even if a weapon has full autonomy in, for example, identification and engagement, this may be supported by a very basic level of cognitive sophistication. A landmine, indeed, satisfies the above examples, providing no kinetic autonomy, full engagement autonomy and very limited cognitive capacity.[24] There may be full autonomy in some aspects of behaviour and not in others.

When it comes to the representation and application of behavioural, and legal, rules, cognitive autonomy is seen as crucial. It is teleological,[25] insofar as the system combines representational structures for 'belief-desire-intentions (BDI)'.[26] Such a system '[i]n order to realize its desires (goals), […]constructs plans of action on the basis of its model of the relevant facts (beliefs) and commits itself to act according to the chosen plans (intentions).'[27] For Sartor and Omicini 'only teleological systems can be fully endowed with the capacity to be guided by norms, as elements that play a specific role in the deliberative process of such systems.'[28] Such independent, adaptive and purposeful machine agents can exist independently or within 'artificial agent societies',[29] which in weapons systems have often been referred to as 'swarms'.[30]

"Fully autonomous systems" then, in relation to warfighting, are systems that, once deployed, are able to adapt, receive and process feedback, and display a level of functional autonomy that effectively does not distinguish them from human decision makers.[31] If

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23 N. Sharkey, 'Staying in the loop: human supervisory control of weapons' in N. Bhuta *et al*, *Autonomous Weapons Systems: Law, Ethics, Policy* (2016), 23, at 27. See also N. Sharkey, 'Towards a Principle for the Human Supervisory Control of Robot Weapons', (2014) 2 *Politica e Società,* 305, at 316. Sharkey believes that only the first two levels could be morally justified. See also Report of the 2018 session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, par. 23.

24 Sartor and Omicini, *supra* note 19, at 44-8.

25 For an early analysis related with the origins of artificial intelligence and linked to the theory of cybernetics discussed further below, see A. Rosenblueth, N. Wiener and J. Bigelow, 'Behavior, Purpose and Teleology', (1943) 10(1) *Philosophy of Science*, 18.

26 For the term and a theory of 'formalisation of intentions' see A. S. Rao and M. P. Georgeff, 'Modelling rational agents within a BDI architecture' in J. Allen *et al, Principles of Knowledge Representation and Reasoning: Proceedings of the Second International Conference* (1991).

27 Sartor and Omicini, *supra* note 19, at 51.

28 Ibid, 52.

29 See e.g. S. Ossowski, *Co-ordination in Artificial Agent Societies: Social Structures and Its Implications for Autonomous Problem-Solving Agents* (1999).

30 See P. Scharre, *Robotics on the Battlefield Part II: The Coming Swarm* (Oct. 2014); M. Rubenstein *et al,* 'Programmable Self-Assembly in a Thousand-Robot Swarm', (2014) 345, *Science*, 795.

31 See also C. Heyns, 'Autonomous weapons systems: living a dignified life and dying a dignified death' in N. Bhuta *et al*, *Autonomous Weapons Systems: Law, Ethics, Policy* (2016), 3, at 4. J. D. Ohlin, 'The Combatant Stance: Autonomous Weapons on the Battlefield', (2016) 92 *International Law Studies* 1 on 'functional autonomy'. The idea of functional

anything, in fact – and that is really the point – such systems may be capable of a higher level of tactical or even strategic decision-making (cognitive) and war-fighting (kinetic) capacity. This seems to be a shared understanding among states and NGOs, otherwise holding different positions in the autonomous weapons debate. Accordingly, the US Department of Defense refers to '[a] weapons system that, once activated, can select and engage targets without further intervention by a human operator'.[32] Human Rights Watch, while setting out its position against autonomous weapons systems, defines them as '[r]obots that are capable of selecting targets and delivering force without any human input or interaction'.[33] Other states[34] and organisations[35] provide similar definitions. These functions of autonomy, and their escalation, entail both physical and cognitive distancing from human agents in the overall process of targeting.

Although the concept and image of autonomy dominates the discourse in a way that influences, as we will see in the next chapter, much of the scientific research and development, it only partially describes technological escalation. In fact, the AI of war-fighting complements increasing autonomy with what has been called 'merged heteronomy'. Increasing cognitive autonomy, and distance, coexists with increasingly close physical proximity. This serves pragmatic aims: Technological limitations in the fragmented development of different aspects of autonomy, the continuing necessity of human input and the fragility of human/machine networks mean that the individual's continuing presence in the loop remains an operational necessity. This also means that a full-on confrontation with social and political resistance to the reality of distinct 'killer robots' is placed in abeyance. Continuous, if vague, assurances of the human remaining 'in the loop' and retaining 'meaningful control' are thereby facilitated.

And yet, the abeyance is a trap and our presence 'in the loop' is no guarantee. To the extent that 'full autonomy' is understood to require the separate physical existence of an, often anthropomorphised, robot other, it obscures the crucial role that increasing cognitive autonomy plays in a nominally heteronomous decision-making process. Cognitively, as well as physically and kinetically, humans and machines become decreasingly separate, less and less other. Their understanding of the rules, the *nomos*, is merging, as is their physical existence. Increasing autonomy and merged heteronomy serve the same purpose, the same

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autonomy of course hails from Turing's 'imitation game'. See A.M. Turing, 'Computing Machinery and Intelligence', (1950) *Mind: A Quarterly Review of Psychology and Philosophy* 433.

32 United States Department of Defense, *Directive No 3000.09 Autonomy in Weapon Systems* (21 November 2012) Glossary.

33 Human Rights Watch, 'Losing Humanity: The Case Against Killer Robots (November 2012)

34 Examination of various dimensions of emerging technologies in the area of lethal autonomous weapons systems, in the context of the objectives and the purposes of the Convention, submitted by the Netherlands, CCW/GGE.1/2017/WP.2, 9 October 2017.

35 Geneva Academy, *Autonomous Weapon Systems under International Law* (Academy Briefing no. 8, November 2014) 6 available at https://www.geneva-academy.ch/joomlatools-files/docman-files/Publications/Academy%20Briefings/Autonomous%20Weapon%20Systems%20under%20International%20Law_Academy%20Briefing%20No%208.pdf.

teleology of mechanisation. 'The loop', itself, is changing, increasingly relying on artificial intelligence.

2.2 The state of the art-in-the-making

The escalating aspirations of full autonomy, in combination with merged heteronomy, can be seen in both existing and projected weapons technology.[36] At this stage, increasing autonomy is more confidently deployed and developed in defensive weapons systems or in surveillance and evidence gathering technology. There are operational weapons technologies of a defensive nature that employ a level of autonomous decision making.[37] The Goalkeeper close-in weapon system used by the Dutch and other navies, already developed in 1979 and now produced by Thales, operates two radar sub-systems which identify up to 18 targets at once, tracks, prioritises and engages them, using an 'identify friend or foe' (IFF) system.[38] The Quick Kill active protection system, designed for the US army, automatically tracks and destroys anti-tank missiles.[39] An existing weapon displaying a significant degree of automation, if not kinetically emancipated, is the Super aEgis II, an anti-personnel sentry weapon system manufactured by South Korean DoDAMM. The turret gun uses thermal imaging to offer an autonomous detection, tracking and targeting capacity of vehicle or human targets within a 3k range.[40] The weapon, currently operating in the Korean Demilitarized Zone, has the option of operating on a fully automated mode, although it is currently held on a 'slave' mode, with an individual in the loop.[41]

Offensive weapons employing elements of autonomy range from long-range anti-ship smart missiles (LRASM) to the Harpy loitering munitions. The LRASM, manufactured by Lockheed Martin, the first batch delivered in December 2018,[42] is a long-range, precision-guided anti-ship missile, which may chart its course both in accordance with pre-routing as well as autonomously, in order 'to find and destroy its pre-determined target in denied

36 For a number of examples, see also D. Lewis, G. Blum and N. Modirzadeh, *War-Algorithm Accountability* (Harvard Law School Program on International Law and Armed Conflict), August 2016, at 34 *et seq.*

37 See generally Boulanin, *supra* note 22, at 26.

38 See https://www.thalesgroup.com/en/goalkeeper-close-weapon-system# and https://www.defencetalk.com/thales-to-upgrade-dutch-navy-goalkeepers-45747/

39 See https://www.raytheon.com/capabilities/products/aps/: 'The Quick Kill system consists of a multi-mission, fire-control radar that detects and tracks incoming threats, combined with hard-kill countermeasures that serve as a hit avoidance system, enabling multi-tracking and simultaneous multi-engagement of enemy fire for vehicle and squad protection.' See also the Israeli Trophy, developed by Raphael, and a comparison at http://raytheon.mediaroom.com/index.php?item=2251: 'The Quick Kill system consists of a multi-mission, fire-control radar that detects and tracks incoming threats, combined with hard-kill countermeasures that serve as a hit avoidance system, enabling multi-tracking and simultaneous multi-engagement of enemy fire for vehicle and squad protection.'

40 See http://www.dodaam.com/eng/sub2/menu2_1_4.php

41 See also Samsung's SGR-1 sentry robots at http://www.defensereview.com/samsung-sgr-a1-armedweaponized-robot-sentry-or-sentry-robot-remote-weapons-station-rws-finally-ready-for-prime-time/

42 See https://www.flightglobal.com/news/articles/lockheed-martin-delivers-first-long-range-anti-ship-454597/

environments.'[43] Loitering munitions are disposable unmanned combat vehicles, also known as 'kamikaze drones', targeted at an overall area, where they loiter until they can find and strike specific ground targets.[44] While most are currently operated by human agents who 'close the (sensor-to-shooter) circuit and hit the target',[45] according to Maj. Gen. (res.) Gadi Shamni, Head of Israeli Aerospace Industries' Land Systems Division, current technology 'may be operated without human involvement, and such involvement will only depend on the fire employment guidelines that are based on non-technological considerations.'[46]

Ongoing research and development aimed at increasing autonomous kinetic ability is crucially complemented by the investment in the capacity to survey, identify and engage potential targets. Project Maven[47] introduced artificial intelligence and machine learning innovations to intelligence, surveillance and target acquisition (ISR), and integrated it into the battlefield. Massive amounts of data, the product of drone surveillance, are analysed for the identification of objects and potential targets. Machine learning sprints are developing the algorithm.[48] This allows both the classification of images for the US military and the rapid improvement of the program. While Project Maven spokespeople assuage concerns by confirming that individuals are the ones reviewing the algorithms' classifications and selecting the potential targets and that Maven has not been used for specific targeting decisions, the algorithms are tested live integrating the combat theatre, rather than in a lab environment. In the combat theatre, presumably, computer identified objects are actioned. At the same time the algorithm is constantly learning, increasingly ready for fuller autonomy.[49]

Maven was just the beginning.[50] The newly released US Department of Defense (DoD) Artificial Intelligence Strategy[51] is creating a new Joint Artificial Intelligence Centre (JAIC),

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43 See https://www.lockheedmartin.com/us/products/LRASM/overview.html and https://www.youtube.com/watch?v=h449oIjg2kY

44 Boulanin, *supra* note 22, at 50-55. See also https://www.newsweek.com/drones-suicide-kamikaze-war-assassination-missile-uav-war-1340751

45 See http://www.israeldefense.co.il/en/content/loitering-munitions-alter-battlefield

46 See http://www.israeldefense.co.il/en/node/31130

47 Pellerin, 'Project Maven Industry Day Pursues Artificial Intelligence for DoD Challenges', *DoD News,* 27 October 2017, available at www.defense.gov/News/Article/Article/1356172/project-maven-industry-day-pursues-artificial-intelligence-for-dod-challenges/

48 On the role of the sprints see Deputy Secretary of Defense's Memorandum on the Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven), 26 April 2017, available at www.govexec.com/media/gbc/docs/pdfs_edit/establishment_of_the_awcft_project_maven.pdf and D. Lewis, N. Modirzadeh, and G. Blum, 'The Pentagon's New Algorithmic-Warfare Team, *Lawfare*, 26 June 2017 available at https://www.lawfareblog.com/pentagons-new-algorithmic-warfare-team

49 The DoD's Algorithmic Warfare Cross-functional Team (AWCFT)'s "objective is to turn the enormous data available to DoD into actionable intelligence and insights at speed." See Deputy Secretary of Defense's Memorandum on the Establishment of an Algorithmic Warfare Cross-Functional Team (Project Maven), 26 April 2017, available at www.govexec.com/media/gbc/docs/pdfs_edit/establishment_of_the_awcft_project_maven.pdf

50 See https://www.defenseone.com/technology/2018/06/general-project-maven-just-beginning-militarys-use-ai/149363/

51 Summary of the 2018 US Department of Defense Artificial Intelligence Strategy released 12 February 2019 and available at https://media.defense.gov/2019/Feb/12/2002088963/-1/-1/1/SUMMARY-OF-DOD-AI-STRATEGY.PDF (US DoD AI Strategy)

a DoD priority,[52] headed by Lt. Gen. Jack Shanahan, the head of Project Maven. The aims of Maven are at the heart of current US research, which is focusing especially on image analysis,[53] 'improving the capabilities of sensing algorithms for autonomous surveillance and targeting',[54] including through stealth technology for Unmanned Aerial Vehicles (drones), enabling them to operate autonomously in 'communication-denied airspace' for the purposes of both surveillance and targeting.[55] The image recognition automation is not limited to non-human objects, but includes focus on facial recognition software, some research focusing on 'probabilistic algorithms th[at] determine the likelihood of adversarial intent',[56] reflecting the increasing influence of a criminal law paradigm on the law of targeting.

Similar trends may be observed in human/machine technologies. Kinetic autonomy, such as 'Fast Lightweight Autonomy',[57] is combined with the development of natural language processing for human-machine communication.[58] Cognitive autonomy, such as the 'probabilistic programming for advanced machine learning',[59] is sought alongside the ability of AI systems to 'explain themselves' and earn the trust of human beings;[60] and the collaboration of autonomous agents amongst themselves,[61] or under the control of a reduced number of human operators.[62] "[S]warm squadrons of network enabled drones", are, according to the former UK Defence Secretary, part of "the future direction of the

52 Memorandum on the Establishment of Joint Artificial Intelligence Centre, 27 June 2018, available at https://admin.govexec.com/media/establishment_of_the_joint_artificial_intelligence_center_osd008412-18_r....pdf

53 US DoD AI Strategy p. 11. See also on the priority of the automation in geolocation M. Ekelhof, Lifting the Fog of Targeting: "Autonomous Weapons" and Human Control through the Lens of Military Targeting (2018) 71(3) *Naval War College Review*, 61, 80 and fn 107 reporting an interview with NGA technical director and big-data specialist.

54 Boulanin, *supra* note 22, at 17. DARPA's TRACE program is described thus: "The Target Recognition and Adaption in Contested Environments (TRACE) program seeks to develop an accurate, real-time, low-power target recognition system that can be co-located with the radar to provide responsive long-range targeting for tactical airborne surveillance and strike applications." See https://www.darpa.mil/program/trace See also the modestly called 'Imaging Through Almost Anything Anywhere (ITA3)' program here: https://www.darpa.mil/program/fast-lightweight-autonomy

55 Lockheed Martin in the US, BAE Systems (Taranis Programme), and Dassault and Saab (Neuron Programme). See also M. Maas et al, *Artificial Intelligence and the Future of Defense: Strategic Implications For Small- and Medium-Sized Force Providers* (2017), at 44 et seq.

56 See the press release at http://www.modusoperandi.com/modus-operandi-awarded-1-million-u-s-army-contract-for-enemy-and-criminal-behavioral-recognition-system/

57 'The goal of the FLA program is to explore non-traditional perception and autonomy methods that could enable a new class of algorithms for minimalistic high-speed navigation in cluttered environments. Through this exploration, the program aims to develop and demonstrate the capability for small (i.e., able to fit through windows) autonomous UAVs to fly at speeds up to 20 m/s (45 mph) with no communication links to the operator and without GPS guidance.' https://www.darpa.mil/program/fast-lightweight-autonomy

58 See DARPA's project 'Communicating with Computers' (CwC) which is introduced thus: 'The [CwC] program aims to enable symmetric communication between people and computers in which machines are not merely receivers of instructions but collaborators, able to harness a full range of natural modes including language, gesture and facial or other expressions. For the purposes of the CwC program, communication is understood to be the sharing of complex ideas in collaborative contexts.' https://www.darpa.mil/program/communicating-with-computers

59 https://www.darpa.mil/program/probabilistic-programming-for-advancing-machine-Learning

60 'The [Explainable Artificial Intelligence] program will focus the development of multiple systems on addressing challenges problems in two areas: (1) machine learning problems to classify events of interest in heterogeneous, multimedia data; and (2) machine learning problems to construct decision policies for an autonomous system to perform a variety of simulated missions.' https://www.darpa.mil/program/explainable-artificial-intelligence

61 See the Micro Autonomous Systems Technology (MAST) research program at http://www.mast-cta.org/

62 Boulanin, *supra* note 22, at 17.

UK armed forces".[63] Such research aspires to achieve the crucial goal of strengthening network contact in complex human/machine systems, towards their further integration.

Finally, while the Tactical Assault Light Operator Suit (TALOS) project, colloquially referred to as the Iron Man suit, failed, individual components will be used[64] and it represents a clear, if spectacular, statement as to the intended future of heteronomy merging so completely that the distinction between human and machine will increasingly disappear. The suit would be a computerized exoskeleton that would increase both physical and cognitive performance offering "increased survivability, lethality, situational awareness and decreased time to target engagement".[65] The development of Brain-Computer Interface (BCI) is at the heart of DARPA's latest call for an Intelligent Neural Interfaces program, aiming at "modeling and maximizing the information content of biological neural circuits to increase the bandwidth and computational abilities of the neural interface."[66] Cognitive enhancement will be achieved by integrating human and artificial intelligence.[67]

The dialectic of autonomy and merged heteronomy is supported by powerful socioeconomic forces. The new US DoD AI strategy expressly, and insistently, seeks to integrate both academic and commercial actors in the development of future weapons technology.[68] Embracing artificial intelligence is seen as a holistic national, social and economic endeavour; a cultural aspiration.[69] The relationship of Google with Project Maven is indicative of the enthusiasm, the tension and the eventual "synergy" between the military and private commercial actors. An initial embrace,[70] including the use of unsuspecting "gig" workers to "feed the algorithm"[71] and the license for corporations to own the intellectual property of the improved algorithm, led to a high-profile employee reaction and Google's divestment,[72] while the future relationship remains open.[73] While the

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63 For the UK defence minister's statement on developing swarms see https://www.gov.uk/government/speeches/defence-in-global-britain and https://www.bbc.com/news/uk-politics-47192232.

64 See https://www.defenseone.com/technology/2019/02/us-military-chopping-its-iron-man-suit-parts/154706/

65 See https://www.socom.mil/Pages/SOF-AT-L-Seeks-Industry-Partners-for-Future-TALOS-Innovations.aspx

66 See https://www.fbo.gov/index?s=opportunity&mode=form&id=f48385e64664e78b061032cd12b86db5&tab=core&_cview=0

67 See also Y. Sankai and T. Sakurai, 'Exoskeletal cyborg-type robot' (2018) 3(17) *Science Robotics*.

68 US DoD AI Strategy p. 12 referring to "bold new AI initiatives with large industrial partners, small start-ups, and venture capital firms."

69 The DoD's reference to its own culture reflects a broader culture of business and risk. See US DoD AI Summary p. 14: "We are building a culture that welcomes and rewards appropriate risk-taking to push the art of the possible: rapid learning by failing quickly, early, and on a small scale."

70 See S. Gibbs, Google's AI is being used by US military drone program, 7 March 2018, *The Guardian*, available at https://www.theguardian.com/technology/2018/mar/07/google-ai-us-department-of-defense-military-drone-project-maven-tensorflow

71 L. Fang, Google hires gig economy workers to improve artificial intelligence in controversial drone-targeting program, 4 February 2019, *The Intercept*, available at https://theintercept.com/2019/02/04/google-ai-project-maven-figure-eight/

72 See D. Wakabayashi and S. Shane, Google will not review contract that upset employees, 1 June 2018, *Thew New York Times,* available at https://www.nytimes.com/2018/06/01/technology/google-pentagon-project-maven.html

73 L. Fang, Google hedges on promise to end controversial involvement in military drone contract, 1 March 2019, *The Intercept* at https://theintercept.com/2019/03/01/google-project-maven-contract/

US has been the most transparent, or even outspoken,[74] the public/private model that the US has pioneered is being emulated in, for example, Russia, China[75] and Turkey.[76]

States' positions on the degree of weapons emancipation reflect the tension between the technological urge and remaining taboos. They are, accordingly, somewhat vague or open to change. The current U.S. position is set out in the Department of Defense Directive 3000.09 which requires autonomous weapons systems to have the 'capability to allow commanders and operators to exercise appropriate levels of human judgment in the use of force…'[77] and sees the research described above, including Project Maven, as below this threshold.[78] The UK has stated that its current research will make sure that individuals remain 'in the loop'.[79] Other states are unapologetic in allowing themselves flexibility.[80]

What we are witnessing is the gradual identification and assembling of different aspects of autonomous capacity, while, with 'full autonomy' in abeyance, human judgement 'in the loop' is increasingly mechanised through human-machine merging. Both parts of this dialectic contribute to the mechanisation and distancing of the decision-making process

74 See Boulanin, *supra* note 22 and Appendix C for a list of corporations.

75 See E. Kania, Battlefield Singularity: Artificial Intelligence, Military Revolution, and China's Future Military Power (28 November 2017) available at https://www.cnas.org/publications/reports/battlefield-singularity-artificial-intelligence-military-revolution-and-chinas-future-military-power

76 'Turkish air defense and software company HAVELSAN will introduce a state-of-the-art defense system that will incorporate the use of artificial intelligence to recognize faces and license plates to gather data and personal information to prevent terrorist attacks. All photos and personal information of a suspected terrorist will be scanned and searched for, and security authorities will make sure if an arrest warrant was previously issued for the suspect. The system will be able to analyze the symmetry of the suspect's face, the retina and the ratio of the eyes, nose and eyebrows, and it will also be able to prepare an analysis on how the suspect walks. The system will automatically alarm security authorities if need be. All these processes will be completed without human activity.' See https://www.dailysabah.com/war-on-terror/2017/10/02/military-to-utilize-artificial-intelligence-for-counterterrorism

77 US DoD Directive 3000.09, 21 November 2012, available at https://www.hsdl.org/?abstract&did=726163. For the 'troubling lacunae' of the Directive, see D. Saxon, A human touch: autonomous weapons, DoD Directive 3000.09 and the interpretation of 'appropriate levels of human judgment over the use of force' in N. Bhuta *et al*, *Autonomous Weapons Systems: Law, Ethics, Policy* (2016), 185.

78 This is reiterated, but not significantly elaborated, in the DoD's AI strategy, p 15. But see the interview with head of the JAIC Jack Shanahan in M. Ekelhof, Lifting the Fog of Targeting: "Autonomous Weapons" and Human Control through the Lens of Military Targeting (2018) 71(3) *Naval War College Review*, 61, 85 and fn. 131 where he allows that 'it could very well be that, if a major conflict arises, all bets will be off, with states feeling forced into more reliance on autonomous systems because their adversaries are willing to take more risk."

79 The UK ministry of defence stated: "UK policy is that the operation of weapons will always be under control as an absolute guarantee of human oversight, authority and accountability. The UK does not possess fully autonomous weapon systems and has no intention of developing them." See M. Savage, 'Humans will always control killer drones, says ministry of defence', *The Observer,* 10 September 2017, available at www.theguardian.com/politics/2017/sep/09/drone-robot-military-human-control-uk-ministry-defence-policy However, a previous commander of the UK Joint Forces Command has expressed his scepticism that such pledges will be maintained. See B. Farmer, 'Prepare for rise of 'killer robots' says former defence chief', *The Daily Telegraph*, 27 August 2017, available at www.telegraph.co.uk/news/2017/08/27/prepare-rise-killer-robots-says-former-defence-chief/

80 See Russian statements linked to the 2017 CCW review conference.: https://admin.govexec.com/media/russia.pdf : "the need to address humanitarian concerns cannot be used as the one and only sufficient prerequisite for imposing restrictive and prohibitive regimes on certain weapons." The latest CCW Report, however, among its 'possible guiding principles' provides that 'Human responsibility for decisions on the use of weapons systems must be retained since accountability cannot be transferred to machines.' See Report of the 2018 session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, par. 21.

that involves legal judgement. This distancing, which I call 'double elevation', will now be placed in its historical perspective, with a view to begin thinking the future role of international law.

3. Double elevation and the distancing of judgement

Technology is not neutral.[81] Assuming the neutrality of technology – and attaching to it the assumed neutrality of law – precludes any critical understanding of either. Indeed, technology's posited neutrality is a harness we need to start without.[82] Technology, its development and use, reflects both theoretical and practical commitments: 'Technology at present is covert philosophy; the point is to make it openly philosophical.'[83] It is also deeply political[84] and it exists in a relationship of co-production with culture, politics and law.[85] As Paul Edwards put it in a seminal study of Cold War weapons technology, 'we can make sense of the history of computers as tools only when we simultaneously grasp their roles as metaphors in …[the period's]… science, politics and culture.'[86] Military technology shapes and reflects politics in a very particular manner[87] and its history is instructive of its promises and purpose.

In this section, I argue that the promise of technological progress and automation in war, as in general, is a promise of civilisation, a promise of improvement. It entails a double elevation: above one's enemy and above one's self. At the centre of it there is a paradoxical assumption, namely that the non-human can be more humane than the human. The elevation above one's enemy combines military distance with a perception of civilizational and moral superiority. The elevation above oneself aims at creating a distance from human features perceived as weak or unreliable. Both full autonomy and merged heteronomy

81 P. Vermaas et al, *A Philosophy of Technology: From Technical Artefacts to Sociotechnical Systems* (2011), at 16 refer to the well-known National Rifle Association slogan: 'Guns don't kill people. People kill people' as an example of a 'succinct way of summarising what is known as the neutrality thesis of technical artefacts.' See also J.C. Pitt, *Thinking about Technology: Foundations of the Philosophy of Technology* (2000).

82 See "Everywhere we remain unfree and chained to technology, whether we passionately affirm or deny it. But we are delivered over to it in the worst possible way when we regard it as something neutral" M. Heidegger, 'The Question Concerning Technology' in *Basic Writings* (2008 [1954]), 217, at 217.

83 P. Agre, *Computation and Human Experience* (1997) at 240.

84 Wiebe E. Bijker, 'Why and How Technology Matters' in R.E. Goodin and C. Tilly (eds.), *The Oxford Handbook of Contextual Political Analysis* (2006), 681.

85 See, more broadly, S. Jasanoff (ed.), *States of Knowledge: The Co-Production of Science and the Social Order* (2004); S. Jasanoff, 'Technology as a Site and Object of Politics' in R.E. Goodin and C. Tilly (eds.), *The Oxford Handbook of Contextual Political Analysis* (2006), 745; W.E. Bijker, T.P. Hughes, and T. Pinch, *The Social Construction of Technology* (1993); Wim A. Smit, 'Military Technologies and Politics' in R.E. Goodin and C. Tilly (eds.), *The Oxford Handbook of Contextual Political Analysis* (2006) 722 at 726: "there is not a "one way impact," neither from military technological developments on politics and political analysis, nor vice versa. The influence is one of mutual shaping,[…]the *co-evolution* of military technology and both politics and political analysis"

86 P. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (1997), at ix.

87 Ibid, chapter 2.

require the increasing mechanization of human judgement. What we have learned to understand as the civilisation of war-fighting rests on and pursues its mechanization.

3.1 Rising above one's enemy

Technological distancing aims at developing asymmetry and invulnerability and elevating oneself above one's enemy in both strictly speaking military and broader civilizational terms. The latter type of elevation allows not simply a geographical distance but also a moral distance with significant consequences for the role of law and judgement in killing.

Military technology is central to early imperialist expansion,[88] and its concomitant civilizational pretension, culminating in the steep military and moral asymmetry achieved in 19th century colonial warfare. Churchill's description in the context of the Boer war of the British infantry 'steadily and solidly' firing against the Sudanese Dervishes in 'the most signal triumph ever gained by the arms of science over barbarians', while 'the mere physical act became tedious',[89] is illustrative. Technology allows military superiority, guaranteeing the physical safety and invulnerability of one's forces; the asymmetry achieved reflects an already assumed civilizational distance which allows a moral dissociation from the act of killing, expressed in the ennui of physical exertion; the civilisation of the technologically advanced party is enforced.[90]

The role of military technology in the elevation above one's enemy is most closely associated with the growth of air power and the aspirations of invulnerability associated with it. Air power, especially in situations of colonial asymmetry, constituted a relationship of vertical distance, allowing the surveillance and policing of one's inferior enemy, both at initial conquest and through the protracted practice of colonial administration and pacification.[91] That colonial relationship achieved new technological heights in the context of the Cold War. Towards the end of the 1960s, the Vietnam impasse pushed for the assertion of asymmetry through the development of an automated battlefield to improve targeting capacity,[92] and protect American soldiers.[93] Operation Igloo White attempted the

88 G. Parker, *The Military Revolution: Military Innovation and the Rise of the West1500-1800* (1996). C.M. Cipolla, *Guns, Sails, and Empires: Technological Innovation and the Early Phases of European Expansion, 1400–1700* (1988).
89 Winston Churchill, *The River War: An Account of the Reconquest of the Soudan* (1899) in D.R. Headrick, *The Tools of Empire* (1981) at 118.
90 See also T. Asad, *On Suicide Bombing* (2007), 34: 'The modern Western army is concerned with engaging efficiently with dangerous, because underdeveloped, peoples, in ways that are at once ruthless and humane, in which brutal attack may become a civilizing sign.'
91 C. Munro, 'Mapping the Vertical Battlespace: Towards a legal cartography of aerial sovereignty' (2014) 2(2) *London Review of International Law* 233–61; D. Gregory, 'From a View to a Kill: Drones and Late Modern War', (2011) 28(7-8), 188. *Theory, Culture & Society*; S. Moyn, 'Drones and Imagination: A Response to Paul Kahn*',* (2013) 24(1) EJIL 227.
92 B. Hacker, 'The Machines of War: Western Military Technology 1850–2000', (2006) 21(3) *History and Technology* 255.
93 See G. Chamayou, *Drone Theory* (2015) 21-22 citing a study of 'remote control in hostile environments' by J Clark, in 1964, finding that 'consciousness is transferred to an unvulnerable mechanical body [and s]pace is divided into two: a hostile area and a safe one.'

surveillance of the Ho Chi Minh Trail in Laos through the use of camouflaged sensors designed to detect different types of human activity, including body heat, vehicle noise or the smell of human urine,[94] or sweat.[95] When picked up, such activities appeared on the screens in the HQ's terminals in Thailand and fed into the targeting system of military aircraft. A 'kill box'[96] was constructed and targeted. The operation's 'centralized, computerized, automated method of 'interdiction' relied on an active global defence and aspirations for the full automation of the battlefield. These are set out by General William Westmoreland, the Chief of Staff of the U.S. Army at the time, in a tenor strongly evocative of our present debate:

> On the battlefield of the future, enemy forces will be located, tracked, and targeted almost instantaneously through the use of data links, computer assisted intelligence evaluation, and automated fire control. . . . I see battlefields on which we can destroy anything we locate through instant communications and the almost instantaneous application of highly lethal firepower… [A]n improved communicative system. . . would permit commanders to be continually aware of the entire battlefield panorama down to squad and platoon level.... I am confident the American people expect this country to take full advantage of its technology- to welcome and applaud the developments that will replace wherever possible the man with the machine. . . With cooperative effort, no more than 10 years should separate us from the automated battlefield.[97]

As it turns out, Operation Igloo White was a complete failure.[98] And yet the technological ambition remained. In 1973 the *New Scientist* echoed General Westmoreland's technological/military optimism. There was 'at present, great interest in the development of remotely piloted vehicles (RPV's) for missions such as reconnaissance, electronic warfare, ground attack and air-to-air combat.'[99] Increasingly, to these purposes was added another: targeted assassination.

The ambition of the precision of a self-sustaining intelligence/targeting loop in drone warfare illustrates the confluence of offensive and defensive imperatives in elevating oneself above one's enemy. Markus Gunneflo has shown how the practice of and legal justification for targeted killings was developed in Israeli and United States policy as a means of constitutional protection of the citizens to be distinguished from unlawful

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94 A. Jaubert, 'Zapping the Viet Cong by Computer', New Scientist, 30 March 1972, at 685, 687, available at books.google.co.uk/books?id=juOOP4nRFrQC&lpg=PP1&hl=EN&pg=PP1#v=onepage&q&f=false.

95 The 'People Sniffer' "sensitive to infinitesimal quantities of ammonia, can detect human perspiration from a considerable distance." See *ibid.* 688.

96 Cf G Chamayou, *Drone Theory* (2015), chapter 6. .

97 Address by General W.C. Westmoreland, chief of staff, US Army, Annual Luncheon Association of the United States Army, Sheraton Park Hotel, Washington, DC, 14 October 1969 (*Congressional Record,* US Senate, 16 October 1969).

98 Edwards, *supra* note 86, at 7.

99 Dr Frank Barnaby, 'Towards tactical infallibility' 10 May 1973 *New Scientist* 348-54, 351.

assassination.[100] In such 'active defence', especially when exercised globally, we see the merging of the offensive distance of air power, seeking to impose a vertical relationship of war, and the defensive distance of integrated human/machine surveillance systems.

This vision is also reflected in the prioritization in the 1990s of drone research.[101] Drones, both the surveillance and the targeting kind, have been seen as symbolising a 'change of paradigm' in the conduct of war.[102] They, however, follow the trajectory discussed – that of achieving an elevation above one's enemy, associated with geographical distancing and the moral/civilizational distance associated with governing through war from above.[103] The present ambition, of both escalated weapon emancipation and human/machine merging, follows that same path. However autonomous, further distancing remains the goal.[104] This is not a paradigm change.[105] However, to the extent that there is a rapid acceleration of technological development we could, perhaps, refer to an 'avalanche': "when conditions are ripe, individual events, even small ones, can trigger a massive, downward rush."[106] This metaphor may serve to describe a well-established trajectory combined with the feeling that things may be spiralling out of control.

From colonial asymmetry to the post-Cold War fighting of 'terror', the elevation above one's enemy through weapons technology guarantees physical and moral distance; it also denotes, and imposes, the pretention of a higher civilisation. As we will see, the promise of precision, professionalisation, optimisation of decision making – with humans involved, but assisted by technology – underlines another kind of elevation: one that supposedly saves humans from themselves.

3.2 Rising above oneself

100 M. Gunneflo, *Targeted Killing: A Legal and Political History* (2016)
101 A. Cockburn, *Kill Chain*: *Drones and the Rise of High-Tech Assassins* (2016).
102 For their 'mythical' role in the production of a 'new paradigm' of law and war see I. Kalpouzos, 'The Armed Drone' in J. Hohmann and D. Joyce (eds.), *International Law's Objects* (2018).
103 Munro, *supra* note 93; Gregory, *supra* note 93.
104 DARPA's TRACE program sets out the logic quite clearly, using language which connects Vietman's electronic battlefield, through drone use, towards escalated automation, while highlighting the problematic effects of distance on the network's reliability thus requiring the strengthening and further integration of a human/machine system: 'In a target-dense environment, the adversary has the advantage of using sophisticated decoys and background traffic to degrade the effectiveness of existing automatic target recognition (ATR) solutions. Airborne strike operations against relocatable targets require that pilots fly close enough to obtain confirmatory visual identification before weapon release, putting the manned platform at extreme risk. Radar provides a means for imaging ground targets at safer and far greater standoff distances; but the false-alarm rate of both human and machine-based radar image recognition is unacceptably high. Existing ATR algorithms also require impractically large computing resources for airborne applications. Hence, current approaches for inserting ATR into tactical applications either move the processing to remote ground stations or drastically reduce performance to fit legacy airborne platform computing capabilities.' https://www.darpa.mil/program/trace
105 The, arguably overused, phrase, hails from T. Kuhn's, *The Structure of Scientific Revolutions* (1962) where he argues that instead of viewing science as a rational cumulative process, it should be understood as entailing "intellectual revolutions" where "one conceptual world is replaced by another" (p. 10).
106 L. Daston and P. Galison, *Objectivity* (2007), 49.

'We are in an arms race with ourselves – and we are winning'.[107]

Technological evolution in war is not only about overcoming the enemy. It is also about overcoming one's own imperfections in the wielding of violence. It is a process of progress, improvement, rationalization, optimization, ultimately the civilization of war-fighting. The role of this second elevation, which both facilitates and aims to justify the elevation above one's enemy, is often underappreciated. I will highlight it in this section, complementing the historical narrative above and recognising its influence on a certain view of the relationship between technology, war and international law.

Elevation above oneself does not require asymmetrical relationships. The technological impetus of air power did not only serve the purpose of offense. It played a crucial role in the development of the relationship between human and machine for defensive purposes. The efforts to counter distancing and provide an effective defence against the German Luftwaffe and the early smart bomb technology of the V-1 and V-2 missiles significantly pushed forward artificial intelligence research.[108] One such effort, led by Norbert Wiener, focused on the scientific articulation of human-machine interaction and the understanding of a pilot and his aircraft as a single unit, an integrated system, the behaviour of which could be predicted. While not successfully weaponised, the research led to Wiener's theory of cybernetics,[109] a widely influential theory for the scientific understanding of information, communication and the function of individuals in their socio-technical environment.

Cybernetics is crucial for the evolution of human/machine merging, and the perception of self-improvement alongside the elevation above one's adversary. Cybernetics is especially important for re-thinking law and agency in autonomous systems as it is, at the same time, based on a formalised understanding of information as the elementary unit for any sort of communication (human/human, human/machine, machine/human, or machine/machine) while having critical implications in relation to our understanding of agency and autonomy in human/machine systems. Therefore, it can be useful in appreciating that increasing autonomy and merged heteronomy are not opposites and that a 'human-in-the-loop' is not, by itself, the answer to the question of mechanisation of judgement.[110] At the same time, the scientific understanding of human/machine systems *as one entity* in cybernetics allows the discussion of both the influence of artificial intelligence

107 Jerome Wiesner, chairman of the Science Advisor Committee to President John F Kennedy, quoted in Graham Allison and Frederic A. Morris, 'Armaments and Arms Control. Exploring the Determinants of Military Weapons', in F. Long and G. Rathjens (eds). *Arms, Defence Policy, and Arms Control*, (1976) at 119.

108 T. Rid, *Rise of the Machines: The Lost History of Cybernetics* (2017), chapter 1.

109 N. Wiener, *Cybernetics: or control and communication in the animal and the machine* (2013, first published 1948)

110 See also M. Arvidsson, 'Targeting, Gender, and International *Posthuman*itarian Law and Practice: Framing the Question of the Human in International Humanitarian Law' (2018) 44(1) *Australian Feminist Law Journal* 9. See also par. 22 of Annex III of the Report of the 2018 session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems where the 'human' is the only stable parameter in the discussion of meaningful human control over autonomous weapons.

on the application of substantive rules and issues of tracing agency and responsibility in complex human/machine structures.

For cybernetics, as Peter Galison has pointed out, the enemy, the German Luftwaffe, with its smart missiles and able pilots, is already perceived as hyper-rational, an advanced unit of human/machines, 'a mechanized Enemy Other'.[111] The distance already achieved by the enemy is an impetus for understanding them, through Wiener's research, as a merged human/machine system. This perception of the enemy and the effort to predict their behaviour extends to and corresponds to the cybernetic perception of the world, and ourselves, as merged human/machine systems. The understanding of the enemy's humanity as partial, as merged with a technical system, is reflected back to the view of oneself and it is emulated. Their distance becomes our distance; their elevation is the impetus for ours. A formalised system of information sharing and a merging in technological structures is the way forward. This is what cybernetics endeavoured to provide.

Such impetus for self-improvement through military technology was applied to the creation of broader systems for the governance of war. In the Cold War, alongside the offensive asymmetry of Vietnam's aspired automated battlefield, the period saw the creation of sophisticated human/machine systems for defensive purposes as well. The massive investment in the Semi-Automatic Ground Environment (SAGE) system in the first decade of the Cold War – 'the first large-scale, computerized command, control and communications system' was aimed at 'global oversight and instantaneous military response.'[112] The identification of and response to the incoming threats would remain at a distance, achieved through the merging of human and machine surveillance power, in a complex and holistic system of artificial intelligence.

In this mode of active defense, elevation above oneself and elevation above one's enemy are seen as mutually reinforcing. The creation of distance and asymmetry in the elevation above one's enemy envisions the conduct of war through an increasingly vertical relationship akin to governance.[113] This entails qualities and aspirations associated with rational governance.[114] Such qualities, like the rationalisation and optimisation of decision-making, span the range of war-making, from the level of planning and prioritising targets (for example, on the production of 'kill lists'[115]) to the level of the individual decision maker:

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111 P. Galison, 'The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision', (1994) 21(1) *Critical Inquiry* 228. Galison points out, at 231, that, alongside cybernetics, this idea of a calculating enemy also motivated the development of game theory and operations research.

112 Edwards, *supra* note 86, at 75.

113 M Valverde and M Lomas, 'Insecurity and Targeted Governance' in W Larner and W Walters, *Global Governmentality* (2004) 233, at 245.

114 M Weber, 'The Vocation of Science' in Sam Whimster (ed.), *The Essential Weber: A Reader* (2004), 270.

115 See J. Weber, 'Keep adding. On kill lists, drone warfare and the politics of databases' 34(1) (2016) *Society and Space* 107-125; for the construction of kill lists see G. McNeal, 'Targeted Killing and Accountability' 102 (2014) *Georgetown Law Journal* 681-794 and J. Scahill, *The Assassination Complex: Inside The US Government's Secret Drone Warfare Programme* (2016).

the one pressing the button. The self-improvement through technology that puts one party in a position to govern through war is displayed in *how* that party governs through war, justifying its dominance.

Elevation above oneself through technology is not, of course, limited to the conduct of war. Progress and self-improvement through technology is inscribed in a particular narrative of civilisation, evolution and progress. Historical investment in technology has at the same time aimed at the realisation of human potential and the transcendence of human limitations.[116] In this sense, it is a metaphysic. It both celebrates humanity and aims to move beyond it.

This tradition of thought will be engaged with, and related to law, in some more detail in the next section. Here, we will recognise its influence on the way technology is seen as serving the humanisation of war and law. The belief in the improvement of and on humanity can be observed on two levels: Firstly, technology is believed to be a progressive force due to its effects: in the bettering of the conditions of life (or the modalities of killing). Secondly, belief in the salutary and transcending effects of technology is associated and credited to a particular way of thinking,[117] believed to have enabled technological progress in the first place. To the extent that technological progress produces thinking machines, this way of thinking is reified, hardwired, embodied in the technology itself – and fed back to human beings who interact with the machines they have created. The first level of belief in technology can be seen in the context of the discussion of the weapons' effects. The second one is especially relevant to how machines and humans interact with law.

Starting with the former, both distancing and the promise of precision[118] associated with technology – from smart bombs, to drone surveillance/targeting, to algorithmic target selection – are often perceived as allowing for higher levels of discrimination in targeting. It may be that results on the ground challenge such promises,[119] perhaps partly due to the license that users of advanced military technology felt able to take in setting out their input parameters.[120] However, the promise remains, and the development of targeting technology is seen to contribute to the humanisation of war. New weapons, and imagined future weapons all the more, are seen as promising a level of precision heretofore unprecedented.

116 As O'Connell, *supra* note 2, puts it, at 142: "If we want to be more than mere animals, we need to embrace technology's potential to make us machines."
117 See P. Husbands et al, 'Introduction: The Mechanical Mind' in *idem* (eds.), *The Mechanical Mind in History* (2008).
118 On the function of this promise in relation to the object of the drone, see Kalpouzos, *supra* note 106.
119 See International Human Rights and Conflict Resolution Clinic (Stanford Law School) and Global Justice Clinic (NYU School of Law), *Living Under Drones: Death, Injury, and Trauma to Civilians From Us Drone Practices in Pakistan* (September 2012).
120 On the practice of signature strikes see KJ Heller, 'One Hell of a Killing Machine: Signature Strikes and International Law' (2013) *Journal of International Criminal Justice* 89.

This feeling is shared, and expressed, both by governments[121] and scholars.[122] While current technological limitations, for example in terms of the limitations of face recognition technology, are often conceded, the general trajectory of humanisation through precision is repeatedly asserted. Indeed, such precision is identified at various levels, including the identification of kill lists,[123] the taking of precautions,[124] and the launching of attacks,[125] to the extent that scholars even talk of a future *obligation* to use autonomous weapons systems.[126] Technology allows certainty and predictability.[127]

Moreover, as a matter of practice and individual decisions, increasing autonomy and merged heteronomy are seen to contribute to the elimination of mistakes, due to faulty and unreliable human judgement. Drone operators are physically removed from danger and the 'fog of war' is filtered and weakened through the drone's technological apparatus. And yet,

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121 Such statements have been especially made in the context of drones. See D Jackson, 'Obama defends drone strikes,' *USA Today*, January 31, 2012; John O. Brennan, (Assistant to the President for Homeland Security and Counterterrorism, US), 'The efficacy and ethics of US counterterrorism strategy', Woodrow Wilson Center, Washington DC, (30 April 2012) in Jameel Jaffer (ed.), *The Drone Memos* (2016) 199, 207: "it is hard to imagine a tool that can better minimize the risk to civilians"; Harold Hongju Koh (US State Department Legal Advisor), 'The Obama Administration and International Law, Address at Annual Meeting of the American Society of International Law' (25 March 2010) in *id.*, 119. This is also increasingly promised in the context of autonomous weapons. See Group of Governmental Experts of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Humanitarian benefits of emerging technologies in the area of lethal autonomous weapon systems Submitted by the United States of America 28 March 2018 CCW/GGE.1/2018/WP.4 available at https://www.unog.ch/80256EDD006B8954/(httpAssets)/7C177AE5BC10B588C125825F004B06BE/$file/CCW_GGE.1_2018_WP.4.pdf. Following the position that the law of war 'is not meant to blunt the sword, but to sharpen it' the US DoD General Counsel argued that 'human control' as such is not, and should not be, an end in itself' and that '[a]s a factual matter, the use of autonomy in weapon systems has improved the degree of control that human beings exercise over the use of force …[and]… can produce greater accuracy, precision, and speed in weapon systems.' 'Remarks by Defense Department General Counsel Paul C. Ney Jr. on the Law of War' *Just Security* (28 May 2019) at https://www.justsecurity.org/64313/remarks-by-defense-dept-general-counsel-paul-c-ney-jr-on-the-law-of-war/.

122 M Schmitt, 'Autonomous Weapons Systems and International Humanitarian Law: A Reply to Critics', (2013) 4 *Harvard National Security Journal* 1; K Anderson and M Waxman, 'Debating Autonomous Weapon Systems, Their Ethics, and Their Regulation Under International Law', in R Brownsword et al (eds), *The Oxford Handbook of Law, Regulation and Technology* (2017) 1097; Arkin, *supra* note 5; J. Beard, 'The Principle of Proportionality in an Era of High Technology' in C Ford and W Williams, *Complex Battlespaces- The Law of Armed Conflict and the Dynamics of Modern Warfare* (2019)

123 See for example the argument in P. Margulies that the superior pattern recognition capabilities of autonomous weapons will help in 'mapping affinities that can ripen into terrorist affiliations' and can therefore 'be immensely helpful in identifying previous unknown followers of ISIS or other groups and implementing a targeting plan.' See P Margulies, 'Making autonomous weapons accountable: command responsibility for computer-guided lethal force in armed conflicts' in Jens David Ohlin (ed.) *Research Handbook on Remote Warfare* (2017), 405, at 422-3.

124 I.S. Henderson et al, 'Remote and Autonomous Warfare Systems - Precautions in Attack and Individual Accountability' in J. D. Ohlin (ed.), *Research Handbook on Remote Warfare* (2017), 335.

125 See the contribution of Professor Mary Cummings in Annex III of Report of the 2018 session of the Group of Governmental Experts on Emerging Technologies in the Area of Lethal Autonomous Weapons Systems, par. 26 stating that 'Due to the innate neuro-muscular lag of humans to perceive and act upon a situation…lethal autonomous weapons systems would be far more discriminatory provided existing computer perception issues were sorted out. ON human-machine teaming…the ideal system in the battlefield would be the one that could strongly leverage the human-machine team.'

126 See M. Sassoli, 'Autonomous Weapons and International Humanitarian Law: Advantages, Open Technical Questions and Issues to be Clarified' (2014) 91 *International Law Studies* 308, at 320 arguing that to the extent that autonomous weapons may be better at taking precautions commanders may have an obligation to use them.

127 The US DoD AI Strategy, at p. 16, concurs: "We will seek opportunities to use AI to enhance our implementation of the Law of War. AI systems can provide commanders more tools to protect non-combatants via increased situational awareness and enhanced decision support."

the drones' promise of self-elevation above the frailty of human judgement and above the fog of war has proven illusory. Drone operators are still under pressure in making life and death decisions with limited knowledge and their humanity has allowed them to make mistakes, act recklessly and target with prejudice. Nor are they themselves sufficiently distanced from the enemy and elevated above the consequences of their action. Studies have shown that drone operators suffer significant post-traumatic stress.[128] And yet the promise persists: further, or full, automation will leave such flaws behind.

What is more, this trust in the self-elevating power of technology is inscribed in an overall perception of machines as more humane than humans,[129] not prone to sadism and bloodthirstiness, to panic and anger. It has been said that 'robots do not rape.'[130] That '[t]hey can be designed without emotions that cloud their judgment or result in anger or frustration with ongoing battlefield events.'[131] That they are free from the 'fear and hysteria' that push humans towards 'fearful measures and criminal behaviour.'[132]

Technology, and automation, may therefore elevate us above our inhumane humanity. Technology will thus limit the circumstances under which we need to revert to our faulty judgement, especially under pressure. Human judgement, in the conduct of war, is perceived as weak and unreliable. Distance from it is seen as improving, even salutary. We delegate judgement to machines and the de-humanization of war entails its civilisation.

When President Kennedy's scientific advisor referred to the victory in the 'arms race against ourselves', in the quote opening this section, he was not making a philosophical point. He was, rather, referring to the US overcoming difficulties developing the weapons technology that would allow it to win the Cold War. And yet, the arms race against ourselves can be understood to reflect a more fundamental struggle: against human weakness, in body and mind; against the imperfection of our humanity. Technology and war, technology *in* war, are the battlefronts and law plays its part.

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128 "Of the 1084 United States Air Force (USAF) drone operators that participated, a total of 4.3% endorsed a pattern of symptoms of moderate to extreme level of severity meeting criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders-4th edition. The incidence of PTSD among USAF drone operators in this study was lower than rates of PTSD (10–18%) among military personnel returning from deployment but higher than incidence rates (less than 1%) of USAF drone operators reported in electronic medical records." See W. Chappelle et al, 'An analysis of post-traumatic stress symptoms in United States Air Force drone operators' (2014) 28(5) *Journal of Anxiety Disorders* 480. http://www.sciencedirect.com/science/article/pii/S0887618514000656; Chamayou, *supra* note 95, at 117-9.

129 Arkin, *supra* note 5, at xvi. See also Chamayou, *supra* note 95, at 208-9 on the distinction between ontological and axiological humanity.

130 See this position in the otherwise critical report of Special Rapporteur Heyns par. 54: '[Lethal Autonomous Robots] will not be susceptible to some of the human shortcomings that may undermine the protection of life. Typically they would not act out of revenge, panic, anger, spite, prejudice or fear. Moreover, unless specifically programmed to do so, robots would not cause intentional suffering on civilian populations, for example through torture. Robots also do not rape.' See K Bergtora Sandvik and K Lohne, 'Lethal Autonomous Weapons: Killing the 'Robots-don't-Rape' Arguments, *IntLawGrrls Blog*, 5 August 2015, available at https://ilg2.org/2015/08/05/lethal-autonomous-weapons-killing-the-robots-dont-rape-argument/; See also J. Turner, We should regulate, not ban killer robots, 28 August 2017, *The Spectator*, available at https://blogs.spectator.co.uk/2017/08/we-should-regulate-not-ban-killer-robots/

131 Arkin, *supra* note 5, at 29.

132 *Ibid* with reference to M Walzer, *Just and Unjust Wars*.

3.3 The inherent compatibility of legal technics

Elevation above oneself relies on mechanical rationality. The distance it creates from the frailty of human judgement stands on the shoulders of an increasingly hardwired way of thinking. Thinking as calculation, and the perception of the human mind as a machine, have a long tradition in the trajectory of rationalist philosophy. From Hobbes[133] through Leibniz[134] to Descartes[135] the metaphor of mind as machine inspired both a rich philosophy of science and an intense urge for scientism.[136] Descartes' ambitious parallels between machines and non-human animals and his speculation on the creation of indistinguishable automata place him at the centre of this tradition, even though his clear separation of mind from body allowed his cognitive philosophy to remain free of his materialism. To the extent, however, that the mind and cognition are identified with the brain, Cartesianism may 'degenerate' into machinist disembodied cognition.[137] Alongside the submission of the mind, through the brain, to mechanical description, a strand of logical positivism centres on the symbolic representation of the world. For example, in the 20th century, Gottlieb Frege 'showed that rules could be formalized so that they could be manipulated without intuition or interpretation.'[138]

Elizabeth Boden has documented in detail how this tradition of 'mind as machine' and formal logic are central in the development of both the ambitions and the philosophy of cognitive science and artificial intelligence.[139] The rich history of this relationship and the intricacies of the philosophical debate are beyond the scope of our inquiry. And yet that understanding of mind as machine and of thinking as, however complicated, symbolic representation can be found in certain strands of legal thinking, influencing the role of legal scholarship and practice on technology in war. Indeed, the process of and the quest for the establishment of principles, precedents, predictable outcomes and the overall

133 See S Franchi and G Güzeldere, Machinations of the Mind: Cybernetics and Artificial Intelligence from Automata to Cyborgs' in *idem* (eds), *Mechanical Bodies, Computational Minds: Artificial Intelligence from Automata to Cyborgs* (2005), 15, 40-41.

134 See P. Beeley, 'Leibniz and Hobbes' in B. Look (ed.), *The Bloomsbury Companion to Leibniz* (Bloomsbury, 2014) 32-51. See also the influence of Leibniz on Charles Babbage and the creation of his Analytical Engine, the first generally programmable machine in S. Bullock, 'Charles Babbage and the Emergence of Automated Reason' in P. Husbands et al, *The Mechanical Mind in History* (2008), 19-40.

135 While Descartes was not, as a whole, a materialist and believed that reason was beyond the reach of mere machines his role in mechanistic thinking is explored in M. Wheeler, 'God's Machines: Descartes and the Mechanization of Mind' in P. Husbands et al, *The Mechanical Mind in History* (2008), 307.

136 See R. Williams, 'Introduction' in R. Williams and D. Robinson (eds.), *Scientism: The New Orthodoxy* (2015); M. Boudry and M. Pigliucci (eds.), *Science Unlimited? The Challenges of Scientism* (2017).

137 This is also at the centre of Noll's discussion of neurotechnology and the separation between cognition and perception. See at 219-223 with some reference to the literature critiquing 'degenerate Cartesianism' in the philosophy of neuroscience.

138 Hubert Dreyfus, *What Computers Still Can't Do: A Critique of Artificial Reason* (1992), xi

139 E. Boden, *Mind as Machine: A History of Cognitive Science volume I & II* (2006).

professionalization and formalisation of judgement (in war fighting) has been central to the contemporary law of armed conflict project.

There are important parallels between the aspirations and hopes assigned to technology and those assigned to law. Chief technological optimists today, indeed, suggest that automation will simply play the role of making sure the law is enforced,[140] to the extent that 'bad apples' and the 'fog of war' do not interfere. This attitude is especially strong in non-lawyers, perhaps prone to simplistic versions of the law,[141] but it also finds fertile ground in different strands of mainstream legal analysis.

The dominant discourse approaches the present and future regulation of autonomous weapons as a question of compatibility. What is asserted is a set of rules and what is required is for a machine – both the machine's hardware and its software – to be able to meet and implement these rules. The question becomes, for example, whether the principle of distinction or the avowedly more complex principle of proportionality[142] can be articulated in a series of logical steps and whether the machine's technological capacity, for example in image recognition of the received characteristics of a civilian target, is able to perform such a code. Such logical steps can be set out as a mathematical formula[143] or as programming language.[144] Myriad questions can be posed about the specifics of such categorisation, but I am concerned with the overall stance. And this is one of wait-and-see. The position could be simplistically stated thus: 'Currently we do not have the technology that would perform a distinction or proportionality calculation. While we don't have answers to all of the challenges, maybe we will in the future. In which case, the autonomous system will go through a weapons review and this will determine its compatibility with the law of armed conflict.'[145]

One constituency taking such an approach are 'pragmatist' (military) lawyers, who, while of course cognisant of legal complexities, especially those associated with notoriously difficult to apply principles such as proportionality, are open to the logic of the law's codification in algorithms. Such a task of codification is essentially seen as a question for

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140 E.g. Arkin, *supra* note 5.

141 Conversely, idealized versions of the law often feed blanket opposition to autonomous weapons systems, as will be discussed further below.

142 M. Wagner, 'The Dehumanization of International Humanitarian Law: Legal, Ethical and Political Implications of Autonomous Weapons Systems' (2014) 47 *Vanderbilt Journal of International Law* 1371, at 1393.

143 For a recent attempt at articulating the basic principles of distinction, proportionality and precautions as a set of mathematical formulae see M Schmitt and Major M Schauss, 'Uncertainty in the Law of Targeting: Towards a Cognitive Framework' (2019) *Harvard National Security Journal* 148. It should be noted the authors are, however, careful to point out, at 152, that "[t]he formulae should not be viewed as an attempt to reduce targeting decisions to mechanical deterministic calculations" and that their formulations aim to inform the choices of operators, rather than to be imposed through an algorithm.

144 See Arkin, *supra note 5*, and, for example, his programming algorithm for the principle of proportionality at p. 186.

145 The expert contribution of William Boothby at the 2015 CCW Meeting of Experts is typical: "We do not know whether future technology may produce weapon systems that can out-perform humans in protecting civilians and civilian objects. It would in my view be a mistake to try to ban a technology on the basis of its current shortcomings, when in future it may actually enable the law to be complied with more reliably than now." https://www.unog.ch/80256EDD006B8954/(httpAssets)/616D2401231649FDC1257E290047354D/$file/2015_LAWS_MX_BoothbyS+Corr.pdf

engineering. When the technology will allow it, there is no reason why codification may not occur.[146] Therefore, even if one does not rush to diagnose legal salvation through technology *yet*, one does not see why law and automated decision making wouldn't be compatible.

Indeed, jurisprudential approaches especially associated with a strand of philosophy of logic,[147] arguably go further, seeing law and technology as inherently compatible and artificial intelligence as an ideal avenue to discuss questions of legal logic and the categorisation, interpretation and application of rules.[148] Law itself is seen as potentially profiting from the tools of formal logic associated with AI, the two constituting a mutually improving and reinforcing relationship of formalisation.[149] There are two things needed: 'contents to be inserted in the knowledge base, and the choice of formalism (with related formal inferential procedure) in which to represent those contents.'[150] Judgement is, again, reserved on the extent to which technology is currently able to provide the tools for legal interpretation and application – for example in matters of visual recognition, natural language processing, adaptability. And the especial difficulties posed by contextual and qualitative judgements in the application of certain legal rules is recognised.[151] The position about the future is agnostic; or, it is in abeyance. The answer remains to be seen, complex problems of engineering, beyond current science, will need to be resolved. Of course, 'the perfectibility of man is absolutely indefinite'.[152] And law is treated as inherently technological; law *is* a technology – our self-perfection and civilisation will occur through law and technology in tandem.

This is not to discount the potential rigour of analytical logic, the usefulness of some computational tools[153] or the use of pragmatist professionalism when encountering issues in the law's application, including in the context of new weapons technology. It is, however,

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146 See R. Williams, 'Introduction' in R. Williams and D. Robinson, *Scientism: The New Orthodoxy* (2015): 'Technology is the ultimate pragmatism, and in a world dominated by technology, and intoxicated by technological solutions to practical problems, everything is viewed as 'standing in reserve,' ready to be used by or subjected to some sort of technology or technological process.'

147 See generally the work of Giovanni Sartor and the editors and contributors in the Journal *Artificial Intelligence and Law*.

148 See G Sartor, 'Artificial Intelligence in Law and Legal Theory' (1992) 10 *Current Legal Theory,* 1.

149 Ibid, at 2: 'it is true that the analyses of legal theory have rarely attained the level of specificity and precision required by computability, especially because the use of formal methods in law has been limited to a few exceptions. Nevertheless, even informal analyses can be of enormous importance for AI, which is exposed to simplifications and reductionisms also because of its need for formalization.'

150 Ibid, at 23.

151 Ibid, at 36.

152 Condorcet, *Sketch for a Historical Picture of the Progress of the Human Mind* (1795). The phrase was recently cited, with the observation that Condorcet committed suicide in prison during the Terror soon after writing it, in David Bell's rather critical review of Stephen Pinker's 'oversimplified' understanding of the Enlightenment and his "starkly technocratic prescription for the human future". See D. Bell, 'The PowerPoint Philosophe: Waiting for the Enlightenment of Stephen Pinker" *The Nation*, 7 March 2018, at https://www.thenation.com/article/waiting-for-steven-pinkers-enlightenment/

153 See W. Alschner, 'The Computational Analysis of International Law' in R Deplano and N Tsagourias (eds) *Research Methods in International Law: A Handbook* (2019) for the developing techniques in the 'mining' of 'international law as data'.

to suggest that both stances may display a tendency to uncritically embrace a reductive approach to law, through technology, one that will not do justice to its substance, one that pursues the dehumanization of judgement in the service of double elevation. Law as technology, as formal logic to be engineered in artificially intelligent machines, can be seen as rising above the frailty of human judgement.

4. Against Double Elevation

4.1 Angst

The trajectory of optimism has always gone hand in hand with angst. Indeed, at the very start of post-war futuristic engagement optimism and pessimism co-existed. While Norbert Wiener preached the coexistence and self-regulating adaptation of human/machine in his book *Cybernetics*, his intellectual integrity allowed him to repeatedly deplore the social, political and moral dangers of automation, both in a companion volume written for the general public[154] and in his interactions with increasingly starry-eyed disciples.[155]

The prosecution of war heightens such angst. Increasingly, the perils of double elevation are recognised. The trajectory of the debates over the use of "smart bombs" in Kosovo[156] or Iraq to the drone-enabled 'War on Terror' evoke the distancing that elevation above the enemy may produce over the often de-humanized other and the production of indefinite asymmetrical global war. Similarly, elevation above oneself has been perceived to lead to 'the fabrication of political automata'[157] and the loss of freedom. The latter point is meaningfully set out in the context of armed drones by Roger Berkowitz, director of the Hannah Arendt Centre:

> 'In the end, the threat drones pose is not only to civilians in war or to jobs. The real threat is that as our lives are increasingly habituated to the thoughtless automatism of drone behavior, we humans habituate ourselves to acting in mechanical, algorithmic, and logical ways. The danger drones pose, in other words, is the loss of freedom.'[158]

154 See N. Wiener, *The Human Use of Human Beings: Cybernetics and Society* (1950) and idem, 'Some moral and technical consequences of automation' (1960) 131(3410) *Science* 1355. This is developed in more philosophical depth in his *God & Golem, Inc.: A Comment on Certain Points where Cybernetics Impinges on Religion* (1964).

155 One of these was Alice Mary Hilton whose *Logic, Computing Machines and Automation* (1963) placed its hopes on automation for "human beings [to] become truly civilised." See Wiener's letter of 8 March 1963 in Rid, *supra* note 113, at 103.

156 For a conceptual analysis at the time see P Kahn, 'The Paradox of Riskless Warfare', (2002) *Philosophy & Public Policy Quarterly* 2.

157 Chamayou, *supra* note 95, at 205 *et seq.*

158 R Berkowitz, 'Drones and the Question of the "Human"' (2014) 28(2) *Ethics & International Affairs* 159, at 169.

Beyond double elevation, this angst over the loss of judgement, over the loss of control over the moral parameters of war-fighting and decision-making feed into the wider existential fear associated with technological pessimism, namely that the emancipation of the creation will be complete, lost to its creator. This concern, at the level of prediction, fears that we are nearing a 'singularity' where artificial intelligence will fully escape human control. While some have hailed this coming singularity in near-religious terms,[159] and some, associated with the transhumanist movement, invest in what they perceive as our overcoming our essential human weakness and even overcoming death,[160] others are pausing in existential dread.[161] While it is important to separate the angst associated with the loss of control over specific tasks from that over a wider 'sorcerer's apprentice' deluge, such fears are as interrelated as the aspirations that feed them.

What is to be done? How do those not sharing in the enthusiasm of scientism or an agnosticism of piece-meal problem solving engage in the present formation of the future of war, technology and law?

The major stance in opposition to technological escalation towards full autonomy is centering on the taboo of delegating life/death decisions to machines and the innate inability of machines to properly apply law. A public expression of this position is that of the Campaign to Ban Killer Robots.[162] The campaign is notable in resisting both superficial techno-optimism and dangerously instrumental pragmatism. The potential power of mobilisation of public opposition notwithstanding, the position presents some analytical, strategic and conceptual shortcomings.

Firstly, the Campaign's approach starts from an assumption of a fundamental 'change of paradigm'.[163] This doesn't always appreciate the continuing role of technology in war and its function in the double elevation described here. Indeed, I have argued that the escalation towards full autonomy and merged heteronomy represents a continuation of an existing trajectory of distancing through the elevation above one's enemy and above oneself, albeit with a perhaps justified presentiment of an 'avalanche', a violent acceleration of pace, out of control.

Secondly, present practice does not suggest that a prospect of successful imposition of a ban or moratorium is realistic. This is due both to the anticipated military advantage and

159 Kurzweil, *supra* note 2.
160 See O'Connell, *supra* note 2 for interviews with current adherents of the faith.
161 For example, Bostrom, *supra* note 4. Importantly Bostrom was a member of the transhumanist movement; his book has been recently recommended by such techno-optimists as Elon Musk and Bill Gates; his Oxford Project is funded, partly, by the former.
162 See https://www.stopkillerrobots.org; See also Human Rights Watch, 'Making the Case: The Dangers of Killer Robots and the Need for a Preemptive Ban' 9 December 2016 available at https://www.hrw.org/report/2016/12/09/making-case/dangers-killer-robots-and-need-preemptive-ban
163 J. Kellenberger, 'International humanitarian law and new weapon technologies', Thirty-Fourth Round Table on Current Issues of International Law, 8-10 September 2011, available at https://www.unog.ch/80256EDD006B8954/(httpAssets)/F77AF42ED509F890C1257CD90025183F/$file/IHL+&+new+weapon+technologies_Sanremo.pdf

the inscription of this process in socioeconomic structures and expectations, as reflected in the evidence of enthusiastic investment in the acceleration of this trajectory. Instead, as the analysis above has suggested, while the absolute of full autonomy (combining kinetic and cognitive elements) is kept at bay, the ground is constantly prepared.

Thirdly, the primary focus on preventing full autonomy or, inevitably anthropomorphised, 'killer robots' is in danger of missing the target. Autonomy is complemented by increasingly merged heteronomy. As discussed in section 2.1 above, merged heteronomy addresses the logistical limitations of spatially spread human/machine networks. Crucially, while presenting itself as respecting the moral taboo of life-and-death delegation, merged heteronomy advances the mechanisation of judgement in pursuit of double elevation. To the extent that the maintenance of 'meaningful human control' is primarily focused on 'keeping humans in the loop', it is in danger of ignoring the gradual change in the nature and function of that very loop. As reliance on AI increases, it is humans who are becoming the 'killer robots'.

Finally, to the extent that the position relies on the incompatibility of autonomous weapons with international humanitarian law, it may be vulnerable to the complicity, discussed in section 3.3, of certain strands of legal thinking with an understanding of knowledge as 'a large store of neutral data'[164] and the promise of the piece-meal resolution of technical legal problems. It also allows one's intuitive angst to be assuaged by promises of, or indeed steps towards, the panacea of global regulation.[165] As important as such regulation may be in structuring the ambitions of both state and private actors, it would not, per se, address the most fundamental dangers of the mechanisation of judgement.

Law will neither ban nor regulate away what causes our angst. To the contrary, it may be adapted to serve mechanised judgement. If we are to oppose double elevation and the mechanisation of judgement, and hope to use law to this effect, we need legal thinking to serve this purpose. Otherwise, all we can do is surrender to the stance of agnostic abeyance, until the code is engineered.

4.2 Irreducible intelligence, and irreducible law

An opposition to the present future of the loss of judgement requires an understanding of law as irreducible. I have argued that the evolution of new weapons technology towards increasing autonomy and merged heteronomy serves, and accelerates, a double elevation, above one's enemy and above oneself, which pursues the mechanization and distancing of judgement; that to the extent that the role of law, in this context, is viewed as a question

164 H. Dreyfus, *What Computers Can't Do* (1972), at 190.
165 Indeed, the recently released first US DoD AI Strategy Summary gestures, at p. 15, towards 'a global set of military AI guidelines'.

of 'compatibility' or 'adaptability', there is a danger that it, too, would serve this purpose. And yet, while law is no panacea to be administered through regulation or outright proscription, it does not have to be the handmaiden of mechanization. In this section, I conclude by arguing that to think of the law of war in a way that resists the demands of double elevation, we should turn to the philosophical and sociological critique of the cognitive science that buttresses much of the existing logic of artificial intelligence. Alongside our understanding of the historical and material process whereby double elevation and increasing autonomy are produced, outlined above, the critiques of the epistemology of artificial intelligence are a necessary guide for the appreciation, defence, and practice of irreducible legal thought.

Gregor Noll, in his analysis of the influence that the weaponisation of neurotechnology has on IHL, uses the critiques of positivist cognitive science and its reliance on antiquated or simplistic understandings of cognition 'reducing high-level behaviours to low-level, mechanical explanations, formalising them through pure scientific rationality'.[166] He highlights what he calls the 'degenerate cartesianism'[167] of neuroscience, which is expressed in the separation between perception and cognition. Isolating cognition, including legal cognition, from human perception, he argues, reduces 'the legal knowledge of the IHL experts […] to a set of skills regarding a particular procedure to be followed in decision-making and a range of outcomes'.[168]

To understand this process of reduction, the intellectual history of artificial intelligence and the fierce debates around its epistemological qualities are instructive.[169] A 'representationist' theory of mind, understanding thought as the computation of symbols representing reality,[170] trusted and employed, with varying sophistication, by generations of artificial intelligence research, has been consistently criticised since the beginnings of 'good old-fashioned AI (GOFAI)'[171] by Hubert Dreyfus. A philosopher infiltrating the MIT AI community, Dreyfus' 1965 RAND Corporation memorandum[172] and his 1972 book[173] constituted a full-frontal attack on an emerging and ambitious project. Dreyfus argued that representational thinking fails to account for the 'know-how, [which,] along with all the interests, feelings, motivations, and bodily capacities that go to make a human being, would have had to be conveyed to the computer as knowledge. […M]aking our inarticulate,

166 P. Dourish, *Where the Action Is: The Foundations of Embodied Interaction* (2004), at vii.
167 See Noll, *supra* note 17, at 220-3.
168 Ibid 223
169 These were no bloodless academic affair. The personal nature of the debate may be related to the personalities of the participants or their professional investments, but arguably also reflects fundamental differences in respective epistemologies. The personal nature is reflected, for example, in the introductions to the different editions of Hubert Dreyfus' What Computers (Still) Can't Do, the reviews of the book's re-issue in the special issue of volume 80 (1996) of *Artificial Intelligence*, and Boden *supra* 143 chapter 11.
170 For a discussion of different, 'strong and weak', representationist theories see F. Egan, 'Representationism' in E. Margolis et al, *The Oxford Handbook of Philosophy of Cognitive Science* (2012), 250.
171 The term denotes the first phase of artificial intelligence, from the 1950s to the 1990s, also referred to as 'symbolic AI'. It was coined by J. Haugeland in *Artificial Intelligence: The Very Idea* (1985).
172 H. Dreyfus, *Alchemy and Artificial Intelligence* (1965) available at https://www.rand.org/pubs/papers/P3244.html
173 H. Dreyfus, *What Computers Can't Do* (1972)

preconceptual background understanding of what it is like to be a human being explicit in a symbolic representation [is] a hopeless task.'[174]

Symbolic representation, Dreyfus insisted, can only take you so far. According to this view, the AI projects, from the 50s to the 90s, attempting to input a map of reality in a machine, sometimes through the use of distinct 'micro-worlds' which would be used for generalisations, were pointless and doomed to fail.[175] Outside the battles of academia, the futility of perfect representation is, perhaps, best conveyed in a story by Jorge Luis Borges, entitled On Exactitude in Science, so short it may be cited in its entirety:

> ...In that Empire, the Art of Cartography attained such Perfection that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. In time, those Unconscionable Maps no longer satisfied, and the Cartographers Guilds struck a Map of the Empire whose size was that of the Empire, and which coincided point for point with it. The following Generations, who were not so fond of the Study of Cartography as their Forebears had been, saw that that vast Map was Useless, and not without some Pitilessness was it, that they delivered it up to the Inclemencies of Sun and Winters. In the Deserts of the West, still today, there are Tattered Ruins of that Map, inhabited by Animals and Beggars; in all the Land there is no other Relic of the Disciplines of Geography.[176]

A perfect code is impossible, futile and self-defeating. It is not only that we may not be able to agree on and articulate the primary rules to be input in the system,[177] it is that once they are abstracted from their human masters they become 'counterfeit'. This applies to law as much as it applies to the rules of cognition in general.[178]

Machine learning neural networks do not overcome this problem. While these, unlike symbolic AI, don't simply reproduce a symbolic representation map, but develop 'a history of input-output pairs',[179] their learning and adaptive behaviour is second-order, as it follows pre-set parameters. While quantitively sophisticated, they mimic rather than think.[180] Even if mapping and generalisation are adaptive and self-generating, the counterfeit problem

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174 H. Dreyfus, *What Computers Still Can't Do* (1992), at xvi-xvii.

175 *Ibid*, at 4-27.

176 in *The Aleph and Other Stories* (Penguin, 2000, translated by Andrew Hurley), at 181.

177 See for example Haque's point that the disagreements on proportionality 'are substantive, not semantic, and rooted in its contestability, not its vagueness'. In A. Haque, 'Indeterminacy and the Law of Armed Conflict' (2019) 95 *International Law Studies*, p. 15.

178 One of the first cognitive scientists to appreciate Dreyfus' critique recognises that phenomenologists 'point out that in such an approach we are no longer using the theoretical terms in their original authentic sense: We have abandoned the original problem and find ourselves talking about a counterfeit world in place of the one we initially intended to study – a formal world of logic, mathematics and 'bits' of information in place of a human world of experience, knowledge and purpose.' See Z. Pylyshyn, 'Minds, machines and phenomenology: Some reflections on Dreyfus' 'What computers can't do'' (1974) 3(1) *Cognition*, 57, 63.

179 Dreyfus, *supra* note 175, at xv.

180 See also Berkowitz, *supra* note 161, at 165, on the question of drone-generated art.

remains. 'Deep learning' is as vulnerable to the critique as symbolic representation was. It is not only that AI has, so far, failed beyond the reproduction of mechanic tasks. It is that it can never succeed. In his final piece of writing, more than forty years after his first missive, Dreyfus argues that, because "how we directly pick up significance and improve our sensitivity to relevance depends on our responding to what is significant for us" given our particular characteristics, for a non-representational AI to be successful

> we would not only need a model of the brain functioning underlying coupled coping […], but we would also need—and here's the rub—a model of our particular way of being embedded and embodied such that what we experience is significant for us in the particular way that it is. That is, we would have to include in our program a model of a body very much like ours with our needs, desires, pleasures, pains, ways of moving, cultural background, etc.[181]

Our distinct cognitive functions cannot be abstracted from our overall existence. Importantly, while expressed in the language of functionality and prediction, Dreyfus' discussion of 'what computers *can't* do' entails what they *shouldn't* (try to) do. Using the emotive language of 'obscenity' and 'disgust', Joseph Weizenbaum's[182] epistemology is more avowedly existentialist: 'an organism is defined, in large part, by the problems it faces. Man faces problems no machine could possibly be made to face. Man is not a machine.'[183] Indeed, to the question posed to him by the eminent AI researcher John McCarthy "What do judges know that we cannot tell a computer?"[184] Weizenbaum responded violently: 'The very asking of the question […] is a monstrous obscenity. That it has to be put into print at all, even for the purpose of exposing its morbidity, is a sign of the madness of our times.'[185]

If Dreyfus and Weizenbaum decry the futility and impoverishment of cognitive reduction, the sociology of science highlights the consequences in human/machine systems. One of the reviewers of the 1992 re-issue of Dreyfus' book, Harry Collins, argued that Dreyfus did not go far enough in appreciating the social embeddedness of both computers and humans

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181 H. Dreyfus, 'Why Heideggerian AI failed and why fixing it would require making it more Heideggerian (2007)' in H. Dreyfus and M. Wrathall, *Skillful Coping: Essays on the phenomenology of everyday perception and action* (2014) 250, 272-3. This phrasing is critiquing what Dreyfus considered the artificial intelligence model most removed from representational thinking, Walter Freeman's theory of cognitive science model which "instantiates a genuine intentional arc according to which there are no linear causal connections nor a fixed library of data, but where, each time a new significance is encountered, the whole perceptual world of the animal changes so that significance as directly displayed is contextual, global, and continually enriched." Ibid at 267.

182 See especially J. Weizenbaum, *Computer Power and Human Reason: From Judgment to Calculation* (1976).

183 *Ibid*, 203.

184 McCarthy's answer was 'nothing', as he thought 'all human knowledge could be formally represented by AI'. See E Boden, *Mind as Machine: A History of Cognitive Science volume I & II* (2006) at 851. For the work of John McCarthy, the 'father of AI', according to his own website, see http://jmc.stanford.edu/. McCarthy was also one of the least patient reviewers of Dreyfus' work. See J. McCarthy, 'Review of Hubert Dreyfus, *What Computers Still Can't Do*' (1996) 80 *Artificial Intelligence* 143.

185 Weizenbaum *supra* note 189, 226-7.

as well as, crucially, the concepts that humans are using.[186] There was no independently stable knowledge to be input in the computer in the first place.[187]This unstable knowledge, reduced through programming, is then fed back to humans with the veneer of disembodied objectivity. Twenty-two years later, it is the poverty rather than the dreaded omniscience of artificial intelligence which is the major threat:

> As it is, the big danger facing us is not the Singularity; it is failing to notice computers' deficiencies when it comes to appreciating social context and treating all consequent mistakes as our fault. Thus, much worse, and much more pressing than the danger of being enslaved by enormously intelligent computers, is our allowing ourselves to become the slaves of *stupid* computers – computers that we take to have resolved the difficult problems but that, in reality, haven't resolved them at all: the danger is not the Singularity but the Surrender![188]

The critiques of the epistemology and sociology of artificial intelligence must inform our understanding of its relationship with law. They can help us understand what is lost and impoverished when legal concepts and rules are reduced to algorithm – the futility, but also the harm in the pretension of perfect representation and reproduction. They can also help us understand the process of both intellectual and moral impoverishment in the removal of intelligence from its social context and the outsourcing, through formalisation, of life-and-death decisions to mechanised judgement. The 'surrender' Harry Collins refers to above, can be understood in the context of law as an abdication of responsibility. I am not referring here, *stricto sensu*, to the stretching of individual liability to the breaking point in complex human/machine systems, but to the responsibility inherent in our interactions with the law. Legal rules and principles, such as that of proportionality, reflect a combination of values that are both meaningful and problematic. It is our task, through our situated moral intelligence, flawed as it is, to take responsibility for the rules governing our violence and to act as custodians, interpreters, and appliers of the law. All the more so when these rules and principles are applied by human beings who risk their lives for the collective against the lives of other human beings, in other collectives.

If there is a task for law in countering double elevation, it is not discharged through regulation, but it requires the defence of its complexity, its subtlety and its humanity in a way that resists a mechanistic philosophy of cognition. Legal thinking should not avoid the uncertainty and incommensurability of situated judgement, but embrace it. This is judgement that is situated in human relationships within collective structures; judgement

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186 See H. Collins, 'Embedded or embodied? a review of Hubert Dreyfus' What Computers Still Can't Do' 80 (1996) *Artificial Intelligence* 99, 101-105 referring to late Wittgenstein.

187 Interestingly, Collins identifies an exception of what he calls 'mimeographic actions' 'areas of human life where behavior *can* be substituted for action, where humans could be trained to accomplish satisfactory outcomes in the way that pigeons are trained, and where machines that exhibit the appropriate behavior can stand in for human counterparts. In human life there are no domains that are wholly like this, but many where we strive to make them thus. Initial military training is perhaps the best developed large-scale version but the phenomenon is found on a small scale *within* many domains' *Ibid* at 110.

188 H. Collins, *Artifictional Intelligence* (2018), 5.

in the immediacy of decision-making in battle, which cannot be conclusively determined a priori; judgement when real human beings are making impossible choices.

The quest for the exercise of irreducible intelligence in law does not entail a distinct jurisprudential preference. While the appreciation of the complexity and indeterminacy of legal meaning and the decisive role of social context in both the making and application of the law may be associated with the anti-formalism of pragmatism, critical legal studies or the Third World Approaches to International Law, this is not the goal of this article. Despite the fact that certain strands of formalist or mainstream lawyering seem to be comfortable with their reducibility to algorithmic input, legal thinking and judgement ought to display a situated intelligence irrespective of their jurisprudential politics. Indeed, the law of war will be applied in battle, by soldiers who are unlikely to have subscribed to a particular school of jurisprudence.

Doctrinal scholarship is perfectly capable of irreducible subtlety. Indeed, the challenge that automation poses to positivist scholarship is not the formulation of rules in a way that can be coded, but the contribution to the clarity of the law in a way that cannot be automatically reproduced. But it may also be that the international law of war, in order to address the increasing pressures of double elevation, should step back to question, historicize and theorize[189] its fundamental concepts and their application. The scholars and practitioners of the law of war should study the evolving sociotechnical landscape, and our gradual immersion in human/machine systems.[190] They should take on the epistemological challenge of engaging the elements of its situated subjectivity – the discretion,[191] emotion,[192] imagination,[193] passion[194] in the rules and their application.

Conclusion

The value of the law is precisely in what cannot be grasped in computational form and our legal thinking should reflect this. The present future of the mechanisation of judgement

189 On the relative undertheorization of the laws of war because of the pro-active and pragmatic nature of humanitarianism see F Mégret, 'Theorizing the Laws of War' in A Orford and F Hoffmann, *The Oxford Handbook of the Theory of International Law* (2016), 762.

190 See, in this direction and using cybernetic theory, Lucy Suchman and Juta Weber, 'Human-Machine Autonomies' in in N. Bhuta, S. Beck, R. Geiss, H-Y Liu and C. Kress, *Autonomous Weapons Systems: Law, Ethics, Policy* (2016), 72. See also H-Y Liu, 'From the Autonomy Framework towards Networks and Systems Approaches for 'Autonomous' Weapons Systems' 10 (2019) *Journal of International Humanitarian Legal Studies* 89.

191 On discretion focusing on autonomous weapons see E Lieblich and E Benvenisti, 'The obligation to exercise discretion in warfare: why autonomous weapons systems are unlawful' in N Bhuta *et al*, *Autonomous Weapons Systems: Law, Ethics, Policy* (2016), 245.

192 See, for a recent example, M Deland, M Klamberg and P Wrange (eds.), *International Humanitarian Law and Justice: Historical and Sociological Perspectives* (2019), especially R Sutton, 'A Hidden Fault Line: How International Actors Engage with International Law's Principle of Distinction' in *idem*.

193 For an essay-length introduction focusing on judging see M. Del Mar, 'The Legal Imagination' (2017) *Aeon* available at https://aeon.co/essays/why-judges-and-lawyers-need-imagination-as-much-as-rationality

194 N Modirzadeh, 'Cut These Words: Passion and International Law of War Scholarship' (2019) *Harvard Journal of International Law* (*forthcoming*).

shouldn't be seen as a radical break with the past, an alien invasion. It is, rather, the accelerated evolution of an impoverished tradition. Both increasing automation and merged heteronomy are advancing the distancing and mechanization of judgement in the service of double elevation – against our enemies and against our very selves. While we fear losing our place 'in the loop', that very loop is changing and, potentially with the complicity of legal technics, we are in danger of becoming the killer robots we want to ban. This article aims to contribute to the recognition of these dangers and to begin articulating a response. It is a call for legal thinking to discharge its disciplinary role within a broader philosophical and political battle. If this direction of thought is not prioritised now, the powerful forces of double elevation may reduce law to something that is both unrecognisable and all too recognisable.