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Asleep at the Switch?

How Lethal Autonomous Robots Become a Force Multiplier of Military Necessity

Ian Kerr*
Katie Szilagyi**

Robotic warfare, its proponents tell us,[1] is an extension of human action in battlespace[2]—only, with superior results and to nobler ends. The substitution of machines for humans in international conflict not only will save lives, we are told, robo-soldiers will outperform human soldiers physically, emotionally and ethically.[3] Robots are not vulnerable to the perils that plague humans on the battlefield: exhaustion, elevated emotions, or the need to seek retribution for the death of a comrade. Advanced sensory capabilities not only permit robots to cut through the fog of war—reducing confusion, friendly fire and other erroneous responses. Through a carefully programmed slave-morality, these sophisticated machine systems can better ensure that robot warriors comport with international standards and the ethical rules of just war. With Asimovian aspiration, we are able to program robo-soldiers to be fundamentally decent. This, we are told, will reinforce and enhance international humanitarianism and reduce injustice in armed conflict.

But, is this true?

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* *Canada Research Chair in Ethics, Law and Technology*, University of Ottawa: iankerr@uottawa.ca. The author wishes to extend his gratitude to the Social Sciences and Humanities Research Council and the Canada Research Chairs program for the generous contributions to the funding of the research project from which this article derives. Thanks also to my wonderful colleagues Jane Bailey, Chloe Georas, David Matheson, Madelaine Saginur, Ellen Zweibel, Jason Millar, and the super six pack: Eliot Che, Hannah Draper, Charlotte Freeman-Shaw, Sinzi Gutiu, Katie Szilagyi and Kristen Thomasen for their inspiring thoughts on this important emerging subject.
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[1] Roboticist Ronald Arkin at Georgia Tech is a well-known advocate for the advantages of robot warfare. See Ronald Arkin, "The Case for Ethical Autonomy in Unmanned Systems" (2010) 9 Journal of Military Ethics 332. John Canning makes similar arguments. See John Canning, "A Concept of Operations for Armed Autonomous Systems" presented at 3rd Annual Disruptive Technology Conferences, September 6-7, 2010, Washington, DC [Canning, "Armed Autonomous"]. The US military has employed ethicists and physicists including Patrick Lin and George Bekey to project just how advantageous advanced robotic armies could be. See P Lin, G Bekey & K Abney, "Autonomous military robotics: risk, ethics, and design. Report for US Department of Navy, Office of Naval Research" (2007) San Luis Obispo: Ethics+Emerging Sciences Group at California Polytechnic State University.

[2] In his book "War X", Tim Blackmore considers whether it is time for humans to leave what he terms "battlespace." See Tim Blackmore, *War X: Human Extensions in Battlespace* (Toronto: University of Toronto Press Inc, 2005).

[3] Ronald C Arkin, Patrick Ulam & Alan R Wagner "Moral Decision-making in Autonomous Systems: Enforcement, Moral Emotions, Dignity, Trust and Deception" (2011) *Proceedings of the IEEE Special Issue on Interaction Dynamics at the Interface of Humans and Smart Machines* [Arkin, "Moral"].

In this article, we investigate lethal autonomous robots and their implications for international humanitarian law. In Section I, we survey the current state of the art in military robotics, recognizing that although today's semi-autonomous technologies require a "human in the loop", it may not be long before human participation ceases to be a technological or military imperative. Section II considers the case for lethal autonomous robots and the technological project of programming ethical compliance with international humanitarian norms. To better understand the complexity of such demands, we offer in Section III a careful overview of the key considerations of international humanitarian law. In Section IV, we investigate the philosophical underpinnings of its purported approach—technological neutrality—and some of the problems inherent in that approach. In addition to its superficial and fictitious treatment of the technologies in question, we suggest that this approach permits a deterministic mode of thinking that expands the scope of that which is perceived of as "necessary" as a result of the adoption of a the technology in question. In Section V, we examine the implications of this in the international humanitarian law context, arguing that the "normative pull" of some emerging military technologies reshapes the rules regarding their permissible use. Consequently, we argue, even if lethal autonomous robots can be said to comport with international humanitarian law, they will operate as a force multiplier of military necessity, thus skewing the proportionality metric and amplifying new forms of destructive, lethal force. We conclude in Section VI by calling into question the appropriateness of international humanitarian law as the primary or exclusive means of regulating lethal autonomous military robots.

I. RoboWar

It took less than a decade for RoboWar to move from video game consoles[4] to the military theatre in the Middle East. Robotic weapons can be broadly classified into three categories: (i) *remote-controlled weapons* (*e.g.* unmanned aerial vehicles that require a human operator's confirmation before the weapon's launch sequence can be engaged);[5] (ii) *semi-autonomous robots* (*e.g.* robot sentries that can accept

[4] RoboWar is a freeware web-based game in which aspiring programmers design their own robot in the RoboWar-specific stack-oriented programming language. (RoboTalk). Popular amongst coding enthusiasts in the early days of personal computing, RoboWar exposed programmers to a powerful programming model that was sufficiently simple for users to self-teach and become proficient. The objective of the game is "to make your robot kill all the other robots and be the alone survivor." While originally a closed source software based on the game RobotWar for the Apple II, the source code was released and the game continues to operate in an open source model. RoboWar was particularly popular from 1989-2003, when coding enthusiasts would organize tournaments. The robots from these tournaments are available online. See RoboWar, online: SourceForge <http://robowar.sourceforge.net/RoboWar5/index.html>. See also "RoboWar", online: Wikipedia <http://en.wikipedia.org/wiki/RoboWar>.

[5] P Lin, G Bekey & K Abney, "Autonomous military robotics: risk, ethics, and design. Report for US Department of Navy, Office of Naval Research" (2007) San Luis Obispo: Ethics+Emerging Sciences Group at California Polytechnic State University [Navy Report] at 56.

sensory inputs and execute a specific action from a catalogue of set responses);[6] and (iii) *lethal autonomous robots* (*e.g.* the yet unrealized logical extension and oft-stated end goal of the current technology—machine systems capable of making tactical decisions and performing military operations independent of human input).[7]

Many of our most powerful weapon systems are already imbued with some degree of "autonomy" and, once initiated, are able to carry out operations independent of human control or oversight. For example, torpedoes[8] and cruise missiles[9]—precursors to today's Predator drones[10]—have long been able to determine (within a delimited range of options) the optimal speed and trajectory required to engage a target without human presence and, in some instances, without human intervention.[11] A dramatic improvement over the fledgling application of air power in World War I (WWI), one example of such "smart" bombs are precision-guided munitions, which employ "laser, electro-optical, or infrared guiding systems that keep them on course towards their targets."[12] While precision-guided munitions have become increasingly predominant since first used by American forces in Vietnam, these smart bombs emerged into widespread usage and public consciousness after use by coalition forces in the 1990-1991 Persian Gulf War.[13] Their success at avoiding so-called "collateral damage", particularly through preventing civilian casualties in targeted attacks in urban areas, was highly

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[6] Semi-autonomous robots have not departed completely from the standard of "human in the loop", but delegate increasing amounts of decision-making authority to the robot. Examples of this technology include modern iterations of drones, which operate independently and receive only destination coordinates from transmitters. *Ibid* at 14, 105.

[7] Ronald C Arkin, "Governing Lethal Behavior: Embedding Ethics in a Hybrid Deliberative/Reactive Robot Architecture" (Atlanta: Georgia Institute of Technology, 2007) Technical Report GIT-GVU-07-11, [Arkin, "Governing"] at 4.

[8] Torpedoes were one of the first technologies to self-select their targets, to some degree. American mathematician John Von Neumann and a team of engineers designed a torpedo that received feedback from its environment—much like a household thermostat—to hone in on its destination. See Anthony D'Amato, "International Law as an Autopoietic System" in *Developments of International Law in Treaty Making* (Springer, 2005) at 10.

[9] Cruise missiles employ GPS technology to guide the missile to its target. The discovery of GPS was exalted more for its potential impact on weapons-guidance than for any other application. Modern cruise missiles combine GPS with additional feedback systems to confirm targets. CB Puckett, "In This Era of Smart Weapons, Is a State Under a Legal Obligation to Use Precision-Guided Technology in Armed Conflict?" (2004) 18 Emory Int'l L Rev 645 at 657.

[10] Predator drones, a type of unmanned aerial vehicle, are one of the most well known instances of robotic weapons. About 27 feet in length, Predators resemble "baby planes", although they do not have cockpits. Predators are lightweight as they are constructed from composite materials, are less expensive that other military aircraft, and become a lethal stealth operator when equipped with Hellfire missiles. In their first year of operation by the American military, Predators fired missiles at 115 targets in Afghanistan. PW Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-First Century*, eBook: (New York: The Penguin Press, 2009) [Singer, "Wired"] at 81-90.

[11] Robert Sparrow, "Killer Robots" (2007) 24 Journal of Applied Philosophy 62 at 64 [Sparrow, "Killer"].

[12] Danielle Infeld, "Precision-Guided Munitions Demonstrated Their Pinpoint Accuracy in Desert Storm; But Is A Country Obligated to Use Precision Technology to Minimize Collateral Civilian Injury and Damage" (1992) 26 Geo Wash J Int'l L & Econ 109 at 109.

[13] *Ibid* at 109.

publicized.[14] By the time of the Gulf War, the circular error of probability of bombs dropped was a mere 10 feet, a dramatic improvement over the circular error of probability of 3300 feet expected during WWI.[15] Smart weapons are now the standard for many military applications; indeed, some human rights advocates even argue that only sufficiently smart weapons should be permitted to attack within urban areas.[16]

A significant number of currently operational military robots fall within the category of unmanned aerial vehicles. By its own assessment, the US Department of Defence spent over $3 billion on these vehicles between 1990 and 2000, and another $4 billion from 2000 to 2010.[17] High profile Predator drones attacks on suspected terrorists in Pakistan, Yemen, and elsewhere have recently resulted in numerous front-page headlines.[18] In 2009, the U.S. Air Force trained more remotely controlled aircraft pilots than actual fighter pilots.[19] New applications extend the already strong capabilities of the Predator. One such example, the Global Hawk, has been referred to as "the Predator's big brother."[20] It flies autonomously as opposed to being remotely piloted: an operator tells the UAV to take off with a mere click of a mouse. The Global Hawk then carries out its pre-programmed mission by acquiring directions in real time from its onboard GPS and operates independently until it returns and the pilot "hit[s] the land button."[21]

Land application of robotic weapons is more difficult and, as a result, less common. Robots can have difficulty navigating uneven terrain. Nonetheless, the US Army's Future Combat Systems project, which is currently in development, is aimed at developing a system for rapid deployment that would replace the current main battle tank with unmanned technology.[22] Early entrants to the realm of robotic land weapons include PackBot, a flagship product of the American robot company

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[14] *Ibid* at 110.
[15] GD Bakshi, "Yugoslavia: Air Strikes Test of the Air War Doctrine" (1999) 22 Strategic Analysis: A Monthly Journal of the IDSA, online: <http://www.ciaonet.org/olj/sa/sa_99bag02.html>.
[16] CB Puckett, "In This Era of Smart Weapons, Is a State Under a Legal Obligation to Use Precision-Guided Technology in Armed Conflict?" (2004) 18 Emory Int'l L Rev 645 at 647.
[17] Sparrow, "Killer," *supra* note 10 at 63.
[18] See*, e.g.* Aliza Kassim, "Drone strike hits Pakistani tribal region", 30 March 2012 online: CNN <http://www.cnn.com/2012/03/30/world/asia/pakistan-drone-strike/index.html>; Richard Norton-Taylor, "Rise of the drones poses growing dilemma for military: MoD confronts moral and legal issues as armed robots increasingly take warfare out of human control", 2 April 2012, online: The Guardian <http://www.guardian.co.uk/world/2012/apr/02/rise-of-the-drones-military-dilemma>; Mohammed Ghobari & Mohammed Mukhsaf, "Air strikes in Yemen kill 45 suspected Qaeda militants", 10 March 2012, online: <http://www.reuters.com/article/2012/03/10/us-yemen-airstrike-idUSBRE82905V20120310>.
[19] Loes van Wifferen, *Alienation from the Battlefield: Ethical Consideration concerning Remote Controlled Military Robotics* (MA Thesis, Universiteit Utrecht, 2011) [unpublished].
[20] Singer, "Wired", *supra* note 10 at 92.
[21] *Ibid.*
[22] Sparrow, "Killer", *supra* note 11 at 63

iRobot.[23] First used in rescue efforts on September 11, 2001 to adeptly navigate the carnage at Ground Zero, PackBot was later deployed to Afghanistan to act as a scout in treacherous cave systems.[24] Another land application, the Modular Advanced Armed Robotic System, is a combat robot manufactured by the QinetiQ Group that rolls on tank like treads.[25] Its additional functionality includes day and night vision cameras, a four-barrel grenade launcher, and a 7.62 mm machine gun.[26] A semi-autonomous robot called the Samsung SGR-A1, a robotic sentry that can track multiple moving targets using IR and visible light cameras, patrols the demilitarized zone between North Korea and South Korea.[27] This robot can identify a human target and fire upon it without human input, by detecting and identifying targets with a series of cameras, heat and motion sensors.[28] In its current deployment, a human makes the decision to fire the 5-millimeter light machine gun, but there is also an "automatic" mode where the robot can make its own decision.[29] South Korea aims to use this robot to shoot any human attempting to cross the demilitarized zone.[30]

There are myriad examples to showcase the advanced state of technology today. For instance, the Phalanx system for Aegis-class cruisers can "autonomously perform its own search, detect, evaluation, track, engage and kill assessment functions."[31] Foster-Miller's has developed the Talon SWORDS (Special Weapons Observation Reconnaissance Detection System) platforms.[32] SWORDS vehicles autonomously move towards their targets using its Global Positioning System (GPS), while the firing of weapons remains the responsibility of a soldier that is located a safe

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[23] iRobot purchased its name from the seminal Issac Asimov novel. See generally Issac Asimov, *I, Robot*, (New York, Bantam Books, 1950). The company, founded by three MIT computer specialists, began its operations with small-scale government contracts and efforts at robotic toys. Its first major commercial success was the Roomba, the world's first mass-marketed robotic vacuum cleaner. Roomba was the progeny of a military robot, Fetch, which was designed by the U.S. Air Force in 1997 to remove cluster bomblets from airfields. Singer, "Wired", *supra* note 10 at 51-55.

[24] *Ibid* at 57.

[25] Nathan Hodge, "Robots for Land, Sea, and Air Battles", *The Wall Street Journal* (19 August 2011) online: Wall Street Journal <http://online.wsj.com/article/SB10001424053111904070604576516591798551476.html?mod=googlenews_wsj#printMode>.

[26] *Ibid.*

[27] "Samsung Techwin's SGR-A1 robot sentry video" (14 November 2006) online: Robotic Zeitgeist, Artificial Intelligence and Robotics Blog <http://robotzeitgeist.com/2006/11/samsung-techwins-sgr-a1-robot-sentry.html>.

[28] Andrew Gibson, "Should Killer Robots Be Banned?" LeftFootForward, October 2010, online: Andrew Gibson's Blog <http://andrewgibsondefence.wordpress.com/2010/10/17/should-killer-robots-be-banned-publisher-leftfootforward-org/>. See also Jean Kumagai, "A Robotic Sentry For Korea's Demilitarized Zone" (March 2007) online: IEEE <http://spectrum.ieee.org/robotics/military-robots/a-robotic-sentry-for-koreas-demilitarized-zone>.

[29] *Ibid.*

[30] *Ibid*. See also Arkin, "Governing", *supra* note 7 at 5.

[31] Gary E Marchant et al, "International Governance of Autonomous Military Robots" (2011) 12 Colum Sci & Tech L Rev 272 at 274.

[32] *Ibid*; see also Navy Report, *supra* note 5 at 12.

distance away and remotely executes commands.[33] Lightweight miniature drones such as the RQ-11 Raven, with enhanced live-coverage capability, can be operated by remote or be programmed to operate autonomously.[34] Israel has stationary robotic gun sensor systems fitted with "fifty caliber machine guns and armored folding shields" positioned along its borders with Gaza in "automated kill zones".[35] While the current operation keeps a human in the loop to fire the weapon, autonomous operation is anticipated.[36] An especially notable development, the US Air Force's "Low Cost Autonomous Attack System", is specifically designed to "autonomously search for, detect, identify, attack and destroy theatre missile defence, surface to air missile systems, and interdiction/armour targets of military interest."[37] The system, which is equipped with radar and target recognition, can autonomously select between three different warhead configurations to ensure use of the best weapon for the job.

Systems such as these continue to improve: components become smaller, computer processing becomes more powerful and less expensive and weapons capabilities become more and more adept.[38] The Moore's Law-ish[39] trajectory of military robotics is perhaps best evidenced by the American military operation in Iraq. When the forces first went into Iraq in 2003, only a handful of unmanned aerial vehicles were involved in the operation; that number is now 5300.[40] At its outset, the operation had no robotic systems on the ground; now, there are over 12,000 such systems in place.[41]

Both technological and military standards regarding such weapons are currently premised on a "human in the loop"—for now, human beings are still the gatekeepers of military decision-making.[42] However, as the trajectory of many of the above-described technologies demonstrates, it may not be long before human participation ceases to be a technological or military imperative. More than 40 countries are in

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[33] *Ibid.*

[34] Singer, "Wired", *supra* note 10 at 93. See also "RQ-11 Raven Unmanned Aerial Vehicle, United Stated of America", online: army-technology.com <http://www.army-technology.com/projects/rq11-raven/>.

[35] Arkin, "Governing", *supra* note 7 at 5.

[36] *Ibid.*

[37] Sparrow, "Killer", *supra* note 11 at 63.

[38] *Ibid.*

[39] More than 40 years ago, Intel co-founder Gordon Moore forecasted the rapid pace of technology innovation. His prediction, popularly known as "Moore's Law," describes the doubling power of computer processing. Moore observed that transistor density on integrated circuits had doubled about every two years from 1957 to 1965 and predicted that they would continue to do so until at least 2020: See Gordon Moore, "Cramming more components onto integrated circuits" *Electronics* 38:8 (19 April 1965).

[40] PW Singer, "Military Robots and the Future of War" (Lecture delivered at TED2009, February 2009), online: TED.com <http://www.ted.com/talks/pw_singer_on_robots_of_war.html> [Singer, "TED"].

[41] *Ibid.*

[42] Navy Report, *supra* note 5 at 70.

the process of developing autonomous weapons of various sorts.[43] Many of the systems under development will go far beyond "a 'fire and forget' system capable of determining its trajectory or pursuing its target to some limited extent".[44] We stand on the precipice of a military era that could require us to decide whether and to what extent we should delegate to machine systems the programming of missions, final targeting instructions, and even decisions about whether and when to pull the trigger or push the button.

II. The Case for Lethal Autonomous Robots

A key advantage of adopting lethal autonomous robots is that they could be programmed to circumvent common human frailties. To some extent, existing robots already outstrip their human counterparts in sensing (not to mention recording and broadcasting) their environments. With highly developed sensor systems operating at an incredible speed of transmission, these machines have advanced capabilities that allow them to respond to information from many inputs simultaneously.[45] This enables real-time analytical surveillance of the battlefield, thus reducing the "fog of war".[46] Robotic senses are not clouded by human emotions such as fear, hysteria, anger and frustration.[47] They do not suffer from the human shortcoming of "scenario fulfillment", a propensity in human cognition to ignore or modify incoming information to mesh with their pre-existing beliefs and ideas—what Gary Marchant *et al.* describe as "a form of premature cognitive closure."[48]

Further, since robots need not emulate the human tendency for self-sacrifice, they are better able to carry out operations conservatively in situations when the target has not necessarily been identified. Similarly, such robots could be used in a self-sacrificing manner without the moral reservation of a commanding officer or the need to steel oneself against human survival instincts.[49] Among other things, this could reduce the need for frontline human soldiers. As Peter Singer notes (somewhat tongue in cheek) about the "death" of a PackBot—a key member of most

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[43] Ugo Pagallo, "Robots of Just War: A Legal Perspective" (2011) 24 Philosophy & Technology 301 at 315 [Pagallo, "Just War"].
[44] Sparrow, "Killer", *supra* note 11 at 64.
[45] Ronald Arkin, "The Case for Ethical Autonomy in Unmanned Systems" (2010) 9 Journal of Military Ethics 332 [Arkin, "Ethical"] at 334.
[46] *Ibid* at 333. The fog of war refers to the uncertainty felt in a battlefield situation due to the volatile nature of that milieu and the unavailability of real time updates. This can render a military commander unaware of the force's—and the enemy's—current status and capabilities. Prussian military analyst Carl von Clausewitz is credited with having coined the term in his unfinished opus "Von Kriege" ("On War"). He writes: "The great uncertainty of all data in war is a peculiar difficulty, because all action must, to a certain extent, be planned in a mere twilight, which in addition not infrequently like the effect of a fog or moonshine gives to things exaggerated dimensions and unnatural appearance." See Carl Von Clausewitz, On War, eds. Michael Howard and Peter Paret, Princeton University Press, Princeton, New Jersey, 1976, p. 138.
[47] *Ibid* at 334.
[48] Marchant, *supra* note 31 at 276.
[49] Arkin, "Ethical", *supra* note 45 at 333.

American sentry teams operating in Iraq—when a robot dies, you do not have to write a letter to its mother.[50]

Ronald Arkin also suggests that robotic warriors could be made to perform more ethically than their human counterparts.[51] Those who trumpet the value of human participation in war are confronted with statistics demonstrating that environmental factors lead soldiers to commit war crimes. For example, a report tendered by the Surgeon General of the 2006 American Operation Iraqi Freedom showed there was a tendency to disregard battlefield ethics training.[52] Alarmingly, 10% of American soldiers that served in Iraq reported mistreating non-combatants and one-third of those surveyed would allow torture.[53]

Troops disregard humanitarian requirements for a variety of reasons. In some instances, it is because decisions are emotionally charged, including the quest for revenge upon instances of high friendly losses or frustration at a poorly defined enemy.[54] There is likewise a recurring tendency to dehumanize the enemy by various means, thereby rendering them unworthy of humanitarian protections.[55] Other situations are more banal, such as when troops are immature or have been poorly trained and do not understand the laws of war. Such things can occur as a result of mundane circumstances such as a high turnover in the chain of command, weak leadership, or an issuance of unclear orders.[56] Arkin and others believe that such human frailties could be "designed out" of ethically programmed robots.[57] In addition to all of this, the advent of ethical robots in battlespace offers a resultant decrease in human involvement, which necessarily leads to fewer casualties—at least on one side of the battle.[58]

Will wars that involve more robots and fewer humans better conform to the ideals that undergird the international legal framework for just war? Or, will an increasing automation and robotization of warfare be used, unjustifiably, to redefine what counts as "humane" according to international humanitarian standards?

III. The Norms of International Humanitarian Law

The history of humanitarian law is unquestionably tied to the development of new technology: as war technologies become increasingly advanced and capable of

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[50] Singer, "Wired", *supra* note 10 at 52.
[51] Arkin, "Moral", *supra* note 3 at 4.
[52] Mental Health Advisory Team (MHAT) IV Operation Iraqi Freedom 05-07 (17 November 2006), Office of the Surgeon Multinational Force-Iraq and Office of the Surgeon General United States Army Medical Command [MHAT] at 36.
[53] *Ibid.*
[54] Arkin, "Ethical", *supra* note 45 at 337.
[55] *Ibid.*
[56] *Ibid.*
[57] *Ibid.*
[58] Singer, "Wired", *supra* note 10 at 86.

greater destruction, laws are put in place to limit that destruction.[59] These laws have been conceived in two distinct streams: (i) laws of general application that apply to all instances of warfare to ensure the imperative of humanity modulates how war is waged; and (ii) specific international agreements that prohibit or limit the use of particular weapons, *e.g.* chemical and biological weapons.

One of first international efforts to proclaim standards for a humanitarian approach on the battlefield was the St. Petersburg Declaration of 1868.[60] The effort was convened to respond to a specific technological problem—the invention of bullets that would explode only on contact with a soft surface, such as the human body.[61] The St. Petersburg Declaration banned the use of projectiles of less than 400 grammes in conflicts.[62] It also decreed "the only legitimate object that states should seek to accomplish during war is to weaken the military forces of the enemy."[63]

With this standard in mind, the modern conception of humanitarian law began to emerge. International accords such as the 1899 Hague Declarations,[64] the 1907 Hague Conventions,[65] and the accompanying Regulations, provided a framework of general application that did away with any vestigial "anything goes" mentality for what was acceptable in combat. In particular, the inclusion of the Marten's Clause, a compromise clause first included in the 1899 Hague Declarations, demonstrated the growing commitment to humanitarian precepts.[66] This clause stipulates that even in situations not governed by either customary or treaty law …

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[59] Jakob Kellenburger, "International Humanitarian Law and New Weapon Technologies", 34th Round Table on Current Issues of International Humanitarian Law, San Remo, Keynote Address. (8 September 2011), online: ICRC <http://www.icrc.org/eng/resources/documents/statement/new-weapon-technologies-statement-2011-09-08.htm>. [Kellenburger, "IHL"]

[60] Arguably, there were a few others Conventions that pre-dated the 1868 St. Petersburg Declaration (*e.g.*, the 1856 Paris Declaration on Maritime Law and the 1864 Geneva Convention on the wounded and sick) but this was the first one that issued a specific prohibition against a particular military tactic on the battlefield. See also Isabel Daoust et al, "New wars, new weapons? The obligation of States to assess the legality of means and methods of warfare" (2002) 84 IRRC 345 at 346 [Daoust, "New wars"]; Kellenburger, "IHL", *ibid*.

[61] Daoust, "New wars", *ibid*; see also the *Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight*, Saint Petersburg, 11 December 1868 (29 November by the Julian Calendar) LXIV *UKPP* (1869) 659.

[62] Kellenburger, "IHL", *supra* note 59.

[63] Daoust, "New wars", *supra* note 60 at 346.

[64] *1899 Hague Declaration 3 Concerning Expanding Bullets*, The Hague, 29 July 1899, UKTS 32 (1907), Cd. 3751 (Eng. Fr.).

[65] *1907 The Hague Convention for the Pacific Settlement of International Disputes* UKTS 6 (1971) Cmnd 4575.

[66] The Martens Clause was a compromise clause first suggested by Fyodor Martens at the 1899 Hague Peace Conferences, which also appears in the 1907 Hague Conventions. It states that the "laws of humanity" undergird any adopted regulations, giving both combatants and non-combatants protections stemming from what would be expected per the civilized peoples and the public consciousness. The clause persists today in the descendant Additional Protocol I to the Geneva Conventions at Article 1(2), arguably prohibiting any weapons that are "abhorrent to the public conscience." See Daoust, "New war", *supra* note 60 at 351. See generally, Antonio Cassese, "The Martens Clause: Half a Loaf or Simply Pie in the Sky?" (2000) 11 EJIL 187.

> … populations and belligerents remain under the protection and empire of the principles of international law, as they result from the usages established between civilized nations, from the laws of humanity and the requirements of the public conscience.[67]

This language continues to animate subsequent international law agreements. Concurrently, the stream of specific prohibitions began to expand as well. In 1925, the Geneva Protocol to the 1907 Hague Convention supplemented general prescriptions for appropriate behaviour in battle with a specific prohibition against chemical and biological weapons.[68] This marked the continued development of regulations against specific technologies.

In the immediate aftermath of World War II, global powers convened to establish new rules that would promote humanitarian principles on the battlefield. A need was identified to modify humanitarian law to deal with the exponential advancements in weapons technology.[69] The four *Geneva Conventions* of 1949,[70] direct descendants of the 1907 *Hague Conventions*, codified standards for humanitarian law. The treaties, which clarified states' responsibilities on the battlefield, were—at least in part—a response to the ever-advancing technology that was transforming the nature of war.[71] World War II had served as the backdrop for the introduction of weapons of unprecedented lethality. The *Geneva Conventions* set out rules of general application to guide subsequent conflict with humanitarian principles.

Yet, it was not only the weapons used to wage war that were transformed following WWII: the entire conflict paradigm shifted away from formal declarations of war. Accordingly, a contextual approach was required to better define when a situation could be viewed as an armed conflict and had surpassed the threshold where the rules for conflict situations should apply. The subsequent 1977 *Additional Protocols I and II to the Geneva Conventions*,[72] which arose from an interest in protecting

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[67] *Hague Convention (IV) Respecting the Laws and Customs of War on Land and Its Annex: Regulations Concerning the Laws and Customs of War on Land*, The Hague, 18 October 1907, 2 AJIL (1908) Supplement 117-27 (Eng. Fr.).
[68] *Protocol for the Prohibition of the Use of Asphyxiating, Poisonous or Other Gases and Bacteriological Methods of Warfare*, Geneva, 17 June 1925, UKTS 24 (1930), Cmd. 3604 (Eng. Fr.).
[69] Thomas Michael McDonnell "Cluster Bombs Over Kosovo: A Violation of International Law?" (2002) 44 Ariz L Rev 40 at 64 [McDonnell, "Kosovo"].
[70] *Geneva Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field*, Aug 12 1949, 75 UNTS 31; *Geneva Convention for the Amelioration of the Condition of Wounded, Sick and Shipwrecked Members of Armed Forces at Sea*, Aug 12, 1949, 75 UNTS 85, *Geneva Convention Relative to the Treatment of Prisoners of War*, Aug 12, 1949, 75 UNTS 135; *Geneva Convention Relative to the Protection of Civilian Persons in Time of War,* Aug 12, 1949, 75 UNTS 287.
[71] McDonnell "Kosovo", *supra* note 69 at 64.
[72] *Protocol Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts*, June 8, 1977, 1125 UNTS 609 [*Protocol I*]; *Protocol Additional*

civilians in armed conflict, prescribed the responsibilities of parties to armed conflict within the international humanitarian law framework. *Protocol I* delineated expected behaviour in international armed conflict, and *Protocol II* defined how to appropriately use force in non-international armed conflict. Both protocols restrict military action by demanding that all uses of force accord with certain humanitarian principles.

In this framework, the three key humanitarian principles are (i) proportionality, (ii) discrimination, and (iii) military necessity. These principles guide all tactical decision-making by a state engaged in an armed conflict. Adherence to these principles is designed to both minimize destruction during wartime and facilitate the peace building process after a ceasefire is reached: the hope is that reconciliation is made easier without malicious or indiscriminate attacks during the conflict. The critical legal question is the same irrespective of which weapon is selected: does the specific use comply with international humanitarian law?[73]

To better promote an understanding of the interoperation of these principles, we consider each principle in the context of the following hypothetical case:

> *A militant secessionist group has been operating within State A. They are based in the remote, mountainous terrain near State A's border with State B. After months of political unrest, marked with sporadic violence and large public demonstrations, the secessionist group began carrying out terrorist attacks against State A's civilian population and state infrastructure. Attacks have occurred with increasing frequency and the group is now in open conflict with State A's military. State A's legal adviser has given her legal opinion that the situation rises to the threshold of a non-international armed conflict. With this legal foundation, the President has authorized the use of State A's Predator drone fleet to target and kill members of the secessionist group.*

A. Proportionality

Proportionality requires that any collateral injury to civilians and private property during a military operation must be balanced against the military advantage to be gained by carrying out that operation.[74] Quantifying a proportionate response requires balancing the repercussions of the action against the continuing threat that

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to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of Non-International Armed Conflicts, June 8, 1977, 1125 UNTS 609.

[73] UNHRC, *Report of the Special Rapporteur on extrajudicial, summary, or arbitrary executions,* 14th Sess Supp No 40, UN Doc A/HRC/14/24/Add.6 (2010) at ¶79 [Rapporteur] .

[74] *Protocol I*, *supra* note 72 art 57(2). See also Enzo Cannizzaro, "Contextualizing Proportionality: *jus ad bellum* and *jus in bello* in the Lebanese War" (2006) 88 Int'l Rev Red Cross 779 at 785.

inspires the action.[75] The damage caused through the use of force in a military operation must therefore be proportionate to the strategic importance of using that force. Minor collateral damage can prevent an attack of minor consequence, while considerable collateral damage is permissible in situations when significant military advantage may be achieved. Attacks that cause damage that exceeds the "concrete and direct military advantage anticipated"[76] from that use of that force are disproportionate.

An ethical framework known as the Doctrine of Double Effect[77] is said to justify the proportionality calculus. More nuanced than the maxim that "the end justifies the means", this doctrine asserts that an action with harmful consequences that are inextricably intertwined with its good effect is justifiable so long as the actor intends the good effect and the good effect ultimately outweighs the bad effect, against which due diligence has been exercised to minimize harm. Provided a military target of sufficiently high value is identified, the fully anticipated collateral damage, *e.g.* the death of a known number of civilians, is calculated as proportionate. The doctrine of double effect explains the civilian deaths as being permissible because they were not the primary purpose of executing the operation: even though the deaths were fully foreseeable, they were secondary to the key military objective.[78]

To execute a proportional response, State A would need to weigh the continuing threat posed by the terrorist group against the damage that would be caused by carrying out an operation against them. The proportionality calculus would involve an estimation of effects of the operation, including the number of lives that could be lost and damage to any civilian property. This would then be weighted against the damage that would likely ensue by allowing the terrorist group to continue operating unchecked. If civilian casualties were expected, they would be more easily justified with a high value military target, *e.g.* a leader of the secessionist group or an operational headquarters.

B. Discrimination

Discrimination requires an ability to distinguish between combatants and non-combatants during the course of a military operation. As stated in Article 51(1) of *Protocol I*, civilians must not be directly targeted by a military operation.[79] Weapons and operational strategy must be selected in a manner that minimizes collateral

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[75] Yoram Dinstein, *War, Aggression and Self-Defence*, 3 ed (Cambridge: Cambridge University Press, 2001) at 17 [Dinstein].
[76] *Protocol I*, *supra* note 72 art 51(5)(b).
[77] Thomas Aquinas, *Summa Theologica* (II-II, Qu 64, Art 7).
[78] Doctrine of Double Effect has been explained as "while the death or injury of innocents is always wrong, either may be excused if it was not the intended result of a given act of war." This justifies collateral damage as long as the innocents are not deliberately targeted. See Arkin, "Moral", *supra* note 3 at 4.
[79] *Protocol I*, *supra* note 72 art 51(1).

damage.[80] Yet, the principle of discrimination is complicated by the fact that civilians lose protection under this framework if they directly participate in hostilities.[81] Targeting combatants that are directly participating in hostilities has become an increasingly difficult task as the nature of warfare has been transformed to involve non-state actors as opposed to only uniformed official forces.[82]

To achieve the goal of discrimination, the military operation would need to use a targeted weapon that could distinguish between civilians and combatants. Through use of a Predator drone, State A could avail itself of precise modern targeting technology. Drones are equipped with advanced sensory equipment, including video feedback systems, allowing an operator to make an "eyes on target" determination before remotely deploying the weapon. This helps to ensure that only combatants are targeted. The selection of the weapon would also be informed by the terrain in question: the remote, mountainous nature of the border region wherein the terrorist group is located would be better and more precisely targeted with aerial Predator drone technology as opposed to other means of warfare, *e.g.* land operations.

C. Military Necessity

Military necessity, as its name suggests, requires that an attack must be militarily necessary, *i.e.* the state must only defend itself or seek to guarantee its future security in executing the military operation—no more.[83] The principle is generally recognized to permit:

> … only that degree and kind of force, not otherwise prohibited by the law of armed conflict, that is required in order to achieve the legitimate purpose of the conflict, namely the complete or partial submission of the enemy at the earliest possible moment with the minimum expenditure of life and resources.[84]

There are associated responsibilities to produce intelligence on the effects of the weapons used, the number of civilians that could be affected, and whether those civilians could take cover before an attack.[85] Attacks must have a concrete military

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[80] *Protocol I*, *supra* note 72 art 51(4). See also Dinstein, *supra* note 75 at 119.
[81] *Protocol I*, *supra* note 72 art 51(3).
[82] Nils Melzer, "Interpretive Guidance on the Notion of Direct Participation in Hostilities Under International Humanitarian Law", 7 January 2009, International Committee of the Red Cross, online: <http://www.icrc.org/eng/resources/documents/publication/p0990.htm> at 79 [ICRC, "Direct Participation in Hostilities"].
[83] Christopher Greenwood, "Historical Development and Legal Basis" in Dieter Fleck, ed, *The Handbook of Humanitarian Law in Armed Conflicts,* (New York: Oxford University Press, 1995) 1 at 36.
[84] ICRC, "Direct Participation in Hostilities", *supra* note 82 at 79.
[85] Rapporteur, *supra* note 73 at ¶29; Michael N Schmitt, "Military Necessity and Humanity in International Humanitarian Law: Preserving the Delicate Balance" (2010) 50 VJIL 795 at 828 [Schmitt, "Balance"].

objective; it is not permitted to simply spread terror amongst the civilian population.[86]

In this situation, the selection of the target would be a key consideration in defining military necessity. With a high-value target such as a confirmed secessionist leader known to have incited terror, or an operational headquarters, the military necessity of the operation would be easily justified despite significant casualties. If successful, the attack could disrupt the continued operation of the terrorist group and ensure the future security of civilians in State A currently living under the threat of terrorist attacks. To properly comport with humanitarian law requirements, State A would preface its operation with a thorough intelligence operation to determine what the ramifications of the attack would be. An appropriate military response would be optimized to have a minimal effect on civilians.

D. Humanity

The three integral principles of international humanitarian law are bolstered and informed by the complementary principle of humanity, which is central to any legal analysis. As identified by the International Court of Justice in the *Corfu Channel* case, "elementary considerations of humanity permeate international law."[87] Humanity inhabits a nexus between the three aforementioned principles. In particular, it both complements and is implicit within the principle of military necessity.[88] Proper respect of military necessity forbids the infliction of any suffering, injury, or destruction that is not required to accomplish the stated military objective.[89] In combination with the principle of humanity, this reduces the ambit of possible military action from everything not expressly prohibited by humanitarian law to only that which is truly required to achieve a legitimate military purpose in a specific fact situation.[90] Michael Schmitt confirms the "equipoise" between these countervailing ideas, stating that it "represents a carefully thought out balance between the principles of military necessity and humanity. Every one of its rules constitutes a dialectical compromise between these two opposing forces."[91] Legal theorist Yoram Dinstein describes humanitarian law as being "moulded by a parallelogram of forces: it confronts a built-in tension between the relentless demands of military necessity and humanitarian considerations, working out a compromise formula."[92]

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[86] *Protocol I*, *supra* note 72 art 51(2).
[87] *Corfu Channel (UK v Alb),* 1949 ICJ 4, 22 (Apr 9).
[88] Nils Melzer, "Keeping the Balance Between Military Necessity and Humanity: A Response to Four Critiques of the ICRC's Interpretive Guidance on the Notion of Direct Participation in Hostilities" (2010) 42 International Law and Politics 831 at 908 [Melzer, "Keeping the Balance"].
[89] MN Schmitt, T McCormack, Louise Arimatsu, *Yearbook of International Humanitarian Law 2010* (Springer: The Hague, 2011) at 231. See also ICRC, "Direct Participation in Hostilities", *supra* note 82 at 79.
[90] *Ibid.*
[91] Schmitt, "Balance", *supra* note 85 at 798.
[92] Dinstein, *supra* note 75 at 17.

Returning to the above example, the operation of the principle of humanity is evident in the discussions about military strategy. The motivation for the operation is securing the future security of the state, as opposed to retaliation or retribution. Both the weapon selected and its precise targeting capability, which allows for an operator to distinguish between combatants and non-combatants, create the possibility of avoiding unnecessary casualties or damage. The eventual execution of the proportional response has carefully considered whether civilian casualties may result and is justified through the pursuit of a high value target.

Other elements of this firm humanitarian basis for modern warfare are also codified in the *Geneva* framework. Several of these requirements are particularly informative for considering new technologies. Article 35 of *Protocol I* limits the right of the parties to choose weapons or means of warfare, prohibiting "weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering."[93] Interpreting this provision, the International Court of Justice has defined "a harm greater than that unavoidable to achieve legitimate military objectives." Also in *Protocol I*, Article 36 creates an obligation to assess whether a new weapons, means or methods of warfare would be prohibited, either by the *Protocol* itself or other international law requirements.[94] The text of Article 36 is as follows:

> In the study, development, acquisition or adoption of a new weapon, means or method of warfare, a High Contracting Party is under an obligation to determine whether its employment would, in some or all circumstances, be prohibited by this Protocol or by any other rule of international law applicable to the High Contracting Party.

Notably, some states have developed mechanisms to consider the legality of weapons in accordance with Article 36.[95] Still, this remains an underutilized provision of the *Geneva* framework. Moreover, Article 57(2) requires that military forces must do "everything feasible" to verify the status and nature of the objective,[96] "take all feasible precautions" in planning and executing the attack,[97] "cancel or suspend" the attack if new it becomes apparent that the objective is improper or the loss of life would be excessive,[98] and issue "effective advance warning ... unless circumstances do not permit."[99]

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[93] *Protocol I*, *supra* note 72 arts 35(1), 35(2).
[94] *Ibid* art 36.
[95] These states include Australia, Norway, Sweden, the United States, Belgium, Canada, Denmark, Germany, and the Netherlands. See Daoust, "New war", *supra* note 60 at 354.
[96] *Protocol I*, *supra* note 72 art 57(2)(a)(i).
[97] *Ibid* art 57(2)(a)(ii).
[98] *Ibid* art 57(2)(b).
[99] *Ibid* art 57(2)(c).

In addition, the principle of responsible command requires that an organization have a command structure capable aware of their obligations under the *Protocol* and of respecting humanitarian law.[100] Legal advisers must be available in armed conflict to advise on the applicable legal requirements.[101] These conditions demonstrate how humanity concerns are a cornerstone of operations conducted in accordance with humanitarian law.

E. Humanitarian Law in Application

The influence of weaponry on the type of warfare waged is exemplified by the conflict in Kosovo in the 1990s. The political questions over whether the global community had a responsibility for humanitarian intervention meant the agreed upon operation had to be low-risk.[102] Crafting a low-risk operation was facilitated by technology: Operation Allied Force used aerial bombardment exclusively, with planes flying particularly high—at 15,000 ft or above—to avoid being targeted by Serb surface-to-air missiles.[103] Participating in the coalition of NATO forces was more easily justified on the home front without casualties to report.[104] Yet, the decision to undertake only an air assault created other difficulties. First, Kosovo refugee vehicles were being mistaken for Serb army vehicles,[105] which arguably violated the principle of discrimination. Second, there was significant collateral damage against civilians,[106] which arguably violated the principle of proportionality. The military objective of the initial phase of the operation was to suppress Serb air defence capabilities, while the second aimed to disrupt the communications infrastructure.[107]

While these attacks can perhaps be nonetheless justified through the proportionality calculus, it is easy to see how the available technology is an important variable in that formula. Achieving the designated military objectives may have once required land operations, but the capacity for aerial attacks meant far lower risks for NATO forces. The type of technology delimited the range within which the proportionality calculus took place: the advance decision that only aerial bombardment would be carried out meant that only certain options were considered and the proportionality calculations were accordingly constrained. As a result, the balancing between military necessity and humanity moved further away from the humane.

Further, as the air campaign continued, there was a shift away from using only precision-guided munitions to also dropping cluster munitions, purportedly—per

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[100] *Ibid* art 87.
[101] *Ibid* art 82.
[102] McDonnell, *supra* note 69 at 48.
[103] *Ibid.*
[104] Bakshi, *supra* note 15.
[105] *Ibid.*
[106] *Ibid.*
[107] *Ibid.*

NATO records—as a weapon of convenience.[108] Cluster bombs could not achieve the same degree of accuracy as precision-guided munitions. They caused more civilian casualties during the conflict, and then later acted as landmines once the conflict was over.[109] One commentator showcases the tension as follows:

> Outside of nuclear weapons, biological weapons, or poison gas, it is hard to imagine a weapon more harmful to human beings than cluster bombs. One could persuasively argue that these weapons are so deadly and pernicious that the few who survive may envy the dead. [...] If used to defeat tanks, a well-recognized military objective, it may be difficult to demonstrate that given the armor that one has to penetrate to defeat a tank, that deploying this weapon so violates the Protocol. If deployed solely against troops on the group, the case might be different.[110]

Cluster munitions provide an example of a weapon that, while initially considered advantageous from a tactical perspective, was ultimately found to be inhumane by the international community. In December 2008, the international community opened for signature the *Convention on Cluster Munitions*, prohibiting use and stockpiling of cluster munitions. It came into force in August 2010 after being ratified by 30 countries.[111]

Analysis of the Kosovo operation and the use of cluster munitions confirms the formative influence that the choice of weapon has on the type of conflict that occurs, including the political conversation to enter the conflict, the collateral impacts endured by the civilian population, and the residual destruction that remains in the *post-bellum* period. This discussion suggests, quite logically, that particular kinds of weapon will result in a particular kind of war. When the weapon in question is autonomous, *i.e.*, its operations are independent of human initiation and oversight, this raises a host of concerns.

F. Autonomous Weapons?

It is instructive to revisit the above example, imagining a newer form of Predator drone that can operate independent of human interaction. Let us imagine that such drones have been programmed to comply with humanitarian law and are deployed to the mountainous region between State A and State B in order to dispatch militarily necessary responses within the bounds of proportionality and discrimination. Without the participation of a military pilot with "eyes on target", would the autonomous drone be able to distinguish between a combatant and a

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[108] McDonnell, *supra* note 69 at 48.
[109] *Ibid* at 56.
[110] *Ibid* at 70.
[111] United Nations Office at Geneva, "Disarmament: Convention on Cluster Munitions", online: UNOG, <http://www.unog.ch/80256EE600585943/(httpPages)/F27A2B84309E0C5AC12574F70036F176?OpenDocument>.

civilian? What about a civilian carrying a gun for self-defence, who has never participated in the hostilities? If circumstances changed dramatically, could a robot reassess the situation and compose a proportional response? How would the robot infrastructure respond to a situation where what was computed to be militarily necessary in the situation was simultaneously disproportionate? Or indiscriminately targeted civilians? Would its computational commitment to the laws of war produce legal results? Or, would the robot subvert these principles to deliver a more efficient result. These are some of the questions that need to be answered if lethal autonomous weapons are to be permitted. But they are not the only questions.

IV. Technological Neutrality

As the above questions imply, the focal point in literature to date involves speculation about whether the next generation of military robots can in fact comport with the laws of war. We contend that it is even more important to consider how the introduction of lethal autonomous robots into battlespace might impact international humanitarian norms. We are less interested in how robots will adhere to the law than how their participation in war might change the law.

To better comprehend this possibility, we begin with a suggestion. International humanitarian law can be understood as adopting a particular strategic framework for the regulation of emerging military technologies. This approach is known in other disciplines as the doctrine of *technological neutrality*.[112] Rather than implementing sector specific rules or laws that are tailored to the functionality or capabilities of particular technologies, international humanitarian law rests on a set of foundational principles[113] that are said to be "neutral" with respect to any given technology. On this approach, military technologies are not regulated categorically or by class but through a determination of whether a particular implementation or use conflicts with the underlying principles of international humanitarian law.[114]

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[112] Technological neutrality is a commitment to the idea that laws should be framed generally, as opposed to being designed for a specific technology. This view is intrinsically linked to a value-free understanding of technology itself: "technology is deemed 'neutral' without valuative content of its own." Andrew Feenberg, "Critical Theory of Technology" (1991) online: <http://www.sfu.ca/~andrewf/books/critical_theory_of_technology.pdf> at 5. Moreover, technology-neutral language permits a one-size-fits-all solution to regulatory problems. From a regulatory perspective, employing generic regulations will prove more efficient as it will avoid modifying its entire policy position when the passage of time inevitably delivers new technologies. This ensures not only a non-discriminatory approach that treats different technologies equally when creating regulations themselves, but also a sustainable approach to law making that will prevents frequent revisions or laws based around particular technologies. Ilse M van der Haar, "Technological Neutrality; What Does It Entail?" (March 2007) TILEC Discussion Paper No. 2007-009 at 22-23 [van der Haar, "Neutrality"]. See generally Rajab Ali, "Technological Neutrality" (2009) 12 Lex Electronica, online: <www.lex-electronica.org/docs/articles_236.pdf>.

[113] For example, the principles of distinction, proportionality, military necessity, humanity, etc.

[114] As discussed, there are several international frameworks that prohibit or limit the use specific weapons. These include: the *Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight*, Saint Petersburg, 11 December 1868 (29 November by the Julian Calendar) LXIV *UKPP* (1869) 659; the *Protocol for the Prohibition of the Use of Asphyxiating, Poisonous*

Consequently, a military technology will only be limited or restricted if the manner in which it must be used or the results that it achieves is in conflict with international humanitarian principles.

The underlying approach has been successfully adopted in the regulation of other technologies. In the context of electronic commerce, technological neutrality

> refers to statutory tests or guidelines that do not depend upon a specific development or state of technology, but rather are based on core principles that can be adapted to changing technologies. Since technological change is constant, standards created with specific technologies in mind are likely to become outdated as the technology changes.[115]

Consequently, the standards adopted are deemed to be technology-neutral. The same standards can then be applied across a range of technologies. From a regulatory perspective, employing generic regulations will prove more efficient as it will avoid modifying its entire policy position when the passage of time inevitably delivers new technologies.[116] This ensures not only a non-discriminatory approach that treats different technologies equally when creating regulations themselves, but also a sustainable approach to law making that will prevents frequent revisions or

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or Other Gases and Bacteriological Methods of Warfare, Geneva, 17 June 1925, UKTS 24 (1930), Cmd. 3604 (Eng. Fr.); the *1976 United Nations Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification* Techniques, 2 September 1976, *UKTS* 24 (1979), Cmnd. 7469; the *1980 UN Convention on Prohibitions or Restricting on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects* and its Protocols: (Protocol I: non-detectable fragments, Protocol II: mines, booby-traps and other devices, Protocol III: incendiary weapons, and Protocol IV: blinding laser weapons) 10 October 1980, 1342 UNTS 137; the *1993 Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction*, 1974 UNTS 317 (No. 33757); the *1997 Ottawa Convention on the Prohibition of the Use, Stockpiling, Production, and Transfer of Anti-Personnel Mines and on Their Destruction*, 18 September 1997, UKTS 18 (1999), Cm. 3990 (Eng.); and the *2008 Convention on Cluster Munitions*, 30 May 2008, CCM/77. Still, these conventions remain the exception: in most situations, there is insufficient political will to generate such agreements, even in the most outwardly self-evident cases, *e.g.* nuclear weapons. In the post-bellum period, global powers were unable to reach an accord on the legality of nuclear weapons, despite (or perhaps because of?) the havoc they wreaked in Hiroshima and Nagasaki. The spectre of the Cold War and prospective nuclear arsenals loomed large. Accordingly, conversations about outlawing weapons are tied to fears that those weapons will be used against you once you agree to get rid of your own.

[115] Michael A Geist, "Is There A There There? Towards Greater Certainty for Internet Jurisdiction" (2001) 16:3 Berkeley Tech LJ 1345 at 1359 [footnotes omitted], online: Berkeley Technology Law Journal <http://law.berkeley.edu/journals/btlj/articles/voI16/geist/geist.pdf.> See also Gerald Herrmann, Secretary of United Nations Commission International Trade Law (UNCITRAL),"Establishing a Legal Framework for Electronic Commerce: the Work of the United Nations Commission on International Trade Law"(Paper presented to the International Conference on Electronic Commerce and Intellectual Property (WIPO), September 1999) [unpublished], online: World Intellectual Property Organization <http://ecommerce.wipo.int/meetings/1999/papers/pdf/herrmann.pdf/>

[116] van der Haar, "Neutrality", *supra* note 112 at 22-23.

laws based around particular technologies.[117]

In an effort to avoid re-inventing the legislative wheel for each and every emerging technology, the doctrine of technological neutrality, as a policy objective, tells us that we ought to guide our laws not by the technological state of the art but on the basis of sound legal judgments about the underlying functions that the various relevant technologies aim to achieve. While policy-makers in electronic commerce law have enjoyed success in relying on this doctrine to date,[118] it is instructive to consider why technological neutrality might not be well suited for some emerging technologies.

Consider an example from the field of data protection (which also currently relies on technological neutrality as a guiding principle). Rather than making a separate privacy law for video rental records, another for surveillance cameras, yet another for facial recognition systems, and still another for social network sites, etc., the global approach to data protection has been to develop a core set of functional principles that are meant to adapt to various technologies which will emerge over time. Consequently, most domestic privacy laws are derivative of a set of eight such principles, first articulated by the *Organization for Economic Cooperation and Development* in the 1980s.[119] Focusing on fair information practices like collection limitation, purpose specification, use limitation and the like, the flexibility of privacy law's technology-neutral approach has been quite remarkable in its ability to regulate data collection, use and disclosure across an array of technologies not previously anticipated when the data protection principles were themselves first enunciated.

Despite its success to date, technological neutrality is no panacea. More recently, disruptive technologies have begun to emerge that undermine or otherwise turn-on-its-head one (or more) of data protection's core regulatory principles. For example, *ubicomp*—a set of sensor networks and automating technologies devised to eliminate the need for human interaction during a series of information transactions[120]—disrupts the general data protection requirement of "knowledge

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[117] *Ibid.*

[118] See, *e.g.* UNCITRAL Model Law on Electronic Commerce With Guide to Enactment (1996), online: United Nations Commission on International Trade Law <http://www.uncitral.org/enindex.htm> and its Canadian counterpart, the Uniform Electronic Commerce Act, online: Uniform Law Conference of Canada <http://www.law.ualberta.ca/alri/ulc/current/euecafin.htm>.

[119] The ten principles of fair protection appended in Schedule I of Canada's *Personal Information Protection and Electronic Documents Act* (*PIPEDA*) are modeled after the privacy principles developed by the Organization for Economic Cooperation and Development (OECD). *Personal Information Protection and Electronic Documents Act*, S.C. 2000, c. 5. See also OECD Privacy Principles online: <http://oecdprivacy.org/>.

[120] Ubiquitous computing, known colloquially amongst technophiles as "ubicomp", refers to a future where digital devices are integrated so seamlessly into our daily existence that no one notices their presence. Mark Weiser, widely considered to be the father of ubiquitous computing, begins his seminal piece "The Computer for the 21st Century" with this vivid description: "The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until

and consent" in the collection, use or disclosure of personal information. The practical impossibility of obtaining regular and meaningful consent for every ubiqcomp transaction may result in the need for some new sector specific regulatory approaches once our society fully embraces the model of pervasive computing. As we suggest below, a similar need may arise in international humanitarian law in the case of lethal autonomous robots. Put colloquially, some technologies change the game.

The doctrine of technological neutrality's basic assumption that we can, for particular legal purposes, treat all (or even most) technologies the same is further problematized when it is reduced to the more general proposition that technologies are themselves neutral. This form of technological neutrality treats technological tools as value-free empty vessels, ready to fit the uses of their users.[121] Guns don't kill people," goes the maxim. "People kill people."

Although not frequently consulted in the literature on military technology and international humanitarian law, the field of science and technology studies has had much to say about this form of technological neutrality. As Neil Postman so eloquently put it,

> Embedded in every technology there is a powerful idea, sometimes two or three powerful ideas. Like language itself, a technology predisposes us to favor and value certain perspectives and accomplishments and to subordinate others. Every technology has a philosophy, which is given expression in how the technology makes people use their minds, ...in how it codifies the world, in which of our senses it amplifies, in which of our emotional and intellectual tendencies it disregards.[122]

Despite the very compelling work of Langdon Winner and so many others in the field who have sought to demonstrate that artifacts have politics,[123] we continue to "disregard the fact that many technologies determine their own use, their own effects, and even the kind of people who control them. We have not yet learned to think of technology as having ideology built into its very form."[124] To retell one of the best and most famous examples from the literature, let us consider in some detail the automatic mechanical tomato harvester, a remarkable device developed by agricultural researchers at the University of California in the late 1940s.

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they are indistinguishable from it." See Mark Weiser, "The Computer for the 21st Century" (1991) Scientific American 94.

[121] Feenberg, *supra* note 112.

[122] Neil Postman, The End of Education: Redefining the Value of School (New York: Alfred A. Knopf, 1996) at 192-3.

[123] Langdon Winner, "Do Artifacts Have Politics?" in *The Whale and the Reactor: A Search for Limits in an Age of High Technology*, ed. Langdon Winner (Chicago: University of Chicago Press, 1986) 19. [Winner, "Artifacts"]

[124] Jerry Mander, Four Arguments For The Elimination of Television (New York: William Morrow, 1978) at 350.

Most people would ask—could something as straightforward as a mechanical tomato combine really have an ideology built into its very form?

Here is how Winner characterizes the technology:

> The machine is able to harvest tomatoes in a single pass through a row, cutting the plants from the ground, shaking the fruit loose, and (in the newest models) sorting the tomatoes electronically into large plastic gondolas that hold up to twenty-five tons of produce headed for canning factories. To accommodate the rough motion of these harvesters in the field, agricultural researchers have bred new varieties of tomatoes that are hardier, sturdier, and less tasty than those previously grown. The harvesters replace the system of handpicking in which crews of farm workers would pass through the fields three or four times, putting ripe tomatoes in lug boxes and saving immature fruit for later harvest.
>
> Studies in California indicate that the use of the machine reduces costs by approximately five to seven dollars per ton as compared to hand harvesting. But the benefits are by no means equally divided in the agricultural economy. In fact, the machine in the garden has in this instance been the occasion for a thorough re-shaping of social relationships involved in tomato production in rural California.
>
> By virtue of their very size and cost of more than $50,000 each, the machines are compatible only with a highly concentrated form of tomato growing. With the introduction of this new method of harvesting, the number of tomato growers declined from approximately 4,000 in the early 1960s to about 600 in 1973, and yet there was a substantial increase in tons of tomatoes produced. By the late 1970s an estimated 32,000 jobs in the tomato industry had been eliminated as a direct consequence of mechanization. Thus, a jump in productivity to the benefit of very large growers has occurred at the sacrifice of other rural agricultural communities.[125]

Winner contends that the broad adoption of the mechanical tomato harvester ultimately shifted the norms of tomato farming in California and, indeed, the nature of the tomato itself. His observations offer interesting insights that can be applied to our considerations about the future military adoption of lethal autonomous robots, and its implications for the norms of international humanitarian law and the nature of war itself. But, before delving further into that, let us first take a more careful look at Winner's analysis by imagining a corollary set of norms that would seek to regulate farming (and its environmental impact) by similar means.

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[125] Winner, "Artifacts", *supra* note 123 at 22.

We can imagine an environmental farming law that employs principles similar in nature to international humanitarian law. Eco-just farming might entail that those engaged in farming must likewise adhere to principles of: "proportionality", "distinction" and (let's call it) "agricultural necessity."

Proportionality, in this context, requires that any ecological harm during an agricultural operation must be balanced against the anticipated agricultural advantage gained by carrying out that operation. The principle of distinction, in this context, means that acts of farming should be directed only to agricultural products and not non-agricultural vegetation subsisting in its natural environment. The agricultural necessity principle, in this context, means that an agricultural intervention must be intended to help achieve an agricultural objective and the resulting ecological harm must be proportional and not excessive in relation to the concrete and direct agricultural advantage achieved through the intervention.

We can imagine entrenching these corollary norms as a means of safeguarding the environment against the potential evils of modern agriculture. And yet it is not difficult to see that the outcomes described by Winner would be reproduced. If we can assume that the means by which the harvester is employed does not implicate other non-agricultural vegetation subsisting in its natural environment (Winner did not discuss this), the adoption and use of the mechanical tomato harvester would easily be justified in terms of its agricultural necessity and said proportionality.

The necessity requirement would be achieved simply by ensuring that whatever is deemed an agricultural necessity is characterized as sufficiently important to trump any resultant harms. In this case, the agricultural need to feed many people in and outside of California is met through the enormous increase in yield, the significant reduction in cost, and the incredible overall efficiency in tomato production. Meeting agriculture objectives in this way would be understood as a social benefit that eclipses any sacrifices to the marginal practice of rural agricultural culture. Applying the Doctrine of Double Effect, since the foreseeable harm to rural agricultural practice was inextricably intertwined with the agricultural objectives of increased productivity, efficiency, and cost-effectiveness in the harvesting process, and since the introduction of the mechanical tomato harvester was primarily intended to achieve these overall goods, its adoption will be justified.

The proportionality calculus would generate a similar outcome. Recall that proportionality requires that an agricultural intervention seeking to fulfill an agricultural objective must not be undertaken if the ecological harm is known to outweigh the anticipated agricultural advantage. As is often the case, the harms cannot be measured until the technology is in place. Of course, once it is in place, we are no longer talking about some neutral cost-benefit analysis. The very adoption of this cumbersome and expensive machine system, the layoff of crew upon crew of farm workers, the reconfiguration of farmland, etc., are themselves an assertion of a political preference for one set of values (productivity, efficiency, cost-effectiveness)

over another (homegrown, authentic, domestic,). The introduction of the mechanical tomato harvester is an assertion of one way of life and the negation of another.

This is perhaps most evident in the ultimate effect of the tomato harvester. Here, we are not merely referring to the displacement of a set of rural agricultural practices or the reshaping of social relations in tomato production but, in fact, to an entire way of being in the world. We are referring to the transformation of the tomato itself.

Through a sleepy haze, we almost need to remind ourselves: what was the original agricultural objective in introducing the mechanical tomato harvester?

Upon wakeful reflection, the objective was to *better harvest* tomatoes, which, it turns out, is a completely different goal than to harvest *better tomatoes*. Recall that the only shortcoming of this otherwise incredible agricultural device was that it could not handle soft, juicy (delicious) tomatoes. As Winner described it, the introduction of this technology necessitated plant breeders to come up with "new varieties of tomatoes that are hardier, sturdier, and less tasty than those previously grown."[126]

Asleep at the switch, we practically forget that by permitting this technology we also permit it to determine its own use.

> Shielded by the conviction that technology is neutral and tool-like, a whole new order is built – piecemeal, step by step, with the parts and pieces linked together in novel ways – without the slightest public awareness or opportunity to dispute the character of the changes underway. It is somnambulism (rather than determinism) that characterizes technological politics… Silence is its distinctive mode of speech.[127]

Perhaps it is because of this propensity towards technological somnambulism that, during and after a carefully crafted proportionality analysis, we tend to be dozy in recognizing that the entire balancing act was essentially dictated by the characterization of the objectives and the perceived "necessities" of the situation. "We *need* a new form of tomato," the engineer later tells us. Of course, this was not originally an agricultural necessity. But it became perceived as such just as soon as the social investment in mechanical tomato harvesters was made. Technology can shape our perceived needs. So much the worse for tasty tomatoes.

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[126] *Ibid* at 22.

[127] Langdon Winner, *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought* (Cambridge: The MIT Press, 1978) at 324.

It is in this sense that technology is not neutral and can be used (if we let it) to reshape social norms. As Winner was so clear to point out, this observation does not entail technological determinism.[128] Rather, it recognizes that what technology makes possible has the power to generate in our minds what may later be perceived of as necessary. But only as a result of the adopted technology, which subsequently permits (but does not necessitate) the cart to drive the horse. How else would it seem necessary to produce a kind of tomato that never before existed? The so-called agricultural necessity for a new tomato is not solely the consequence of adopting the mechanical tomato harvester. The ability to see the new tomato as an agricultural necessity is only perfected when plant breeders actually invent a technique for creating one.

At the same time, technology can also induce a related form of dogmatic-slumber[129] that permits another crucial fallacy to occur—an illogical inversion of Kant's famous insight that "ought implies can."[130] Through a strange form of grammatical alchemy

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[128] See generally Robert Heilbroner, "Do Machines Make History?" (1961) 2 Technology and Culture 335; William H. Shaw, "The Handmill Gives You the Feudal Lord: Marx's Technological Determinism", (1979) 18 History and Theory 155; Alvin Hansen "The Technological Interpretation of History" (1921) 36 Quarterly Journal of Economics 72. Winner articulated his view as follows:

> It may seem that the view I am suggesting is that of technological determinism: the idea that technological innovation is the basic cause of changes in society and that human beings have little choice other than to sit back and watch this ineluctable process unfold. But the concept of determinism is much too strong, far too sweeping in its implications to provide an adequate theory. It does little justice to the genuine choices that arise, both in principle and practice, in the course of technical and social transformation. Being saddled with it is like attempting to describe all instances of sexual intercourse based only on the concept of rape. A more revealing notion, in my view, is that of technological somnambulism. For the interesting puzzle in our times is that we so willingly sleepwalk through the process of reconstituting the conditions of human existence.

"Technologies as Forms of Life" in *Philosophy of Technology* (2004) David Kaplan (ed.) 103 at 107 [Winner, "Forms of Life"].

[129] In the preface to *Prolegomena to Any Future Metaphysics*, famously "thanked" David Hume for his arguments about causality, which Kant credited as being "the very thing which many years ago first interrupted by dogmatic slumber and gave my investigations in the field of speculative philosophy quite a new direction." The implausibility of Hume's arguments on cause and effect led Kant to the realization that there were other ways of thinking of things *a priori.* He rejected Hume's reluctant conclusion that reason is deluded about cause and effect and set out to use Hume's argument as "a spark from which light may be obtained" by catching "some inflammable substance." Immanuel Kant, *Prolegomena to Any Future Metaphysics: With Selections from the Critique of Pure Reason* ed. Gary Hatfield (Cambridge: Cambridge University Press, 1997) at 10.

[130] The maxim "ought implies can" is a form of transcendental idealism that leaves open the possibility that we have free will. This ethical framework mandates that an individual must be logically able to perform any action that he or she is morally obligated to perform. As Kant asserts: "For the moral law commands that we *ought* to be better human beings now, it inescapably follows that we must be *capable* of being better human beings." Moreover: "The action to which the 'ought' applies must indeed be possible under natural conditions." Immanuel Kant, *Religion Within the Boundaries of Mere Reason* 6:50. See also Immanuel Kant, *Critique of Pure Reason* A548/B576 p. 473. In the cyberspace context, Lawrence Lessig cautions against the use sweeping rhetoric about the nature of technology, since it can lead to deterministic conclusions. He cites the frequent mention of the very "essence" of the web being a place that cannot be regulated, that its "nature" is to resist

we mistakenly come to believe that because the technology makes something possible, it also makes it necessary. Our perceived needs are thereby (re)shaped by our sense of what is possible. This propensity is crucial to remember in the application of balancing provisions. How technology shapes our perceptions will have a significant affect on our understanding of what is proportional and the means by which we apply principles like agricultural necessity.

Drawing upon Winner's example, outcomes in the military context will further assist in demonstrating the limits of technological neutrality. In the section that follows, we examine the interaction between lethal autonomous robots and the norms of international humanitarian law. First, we briefly investigate the possibility of robots comporting with humanitarian law. Second, we consider in general the normative pull of military technologies, arguing that the mere introduction of some military technologies can actually alter prior norms and practices. Finally, we attempt to show how shifting battle norms might occur through the introduction of lethal autonomous robots. We argue that robotic technologies act as a force multiplier in the determination of military necessity, thus amplifying the amount of permissible destructive force in carrying out an operation.

V. Lethal Autonomous Robots and the Norms of International Humanitarian Law

A. Comporting with International Humanitarian Law

Many proponents believe that lethal autonomous robots will one day reach the level of sophistication necessary to comport with international humanitarian law. The threshold question for the deployment of such a machine is whether it would be capable of selecting appropriately specific targets to achieve the standard required by the discrimination principle. In light of its autonomous operation, discrimination is an important primary consideration since it is a binary standard. A weapon that cannot distinguish between combatants and non-combatants is indiscriminate—and therefore *prima facie* illegal—as it is fundamentally incompatible with the laws of war.[131] One strategic response to an inability to meet the discrimination norm is to limit the use of robots to targeting weapons rather than people.[132] However, even with this strategy, adverse results are foreseeable. How might a machine system differentiate between a friendly peace officer carrying a service weapon and a guerilla warrior with a similar gun? Rob Sparrow rightly contends that it will be exceedingly difficult for a robot to distinguish between "an armed tribesman

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regulation. Yet, if there is any place where nature should have no rule, it is in cyberspace: a place that has been entirely constructed. Lessig characterizes this as "the fallacy of 'is-ism'—the mistake of confusing how something is with how it must be." Lawrence Lessig, *Code: Version 2.0* (New York: Bantam Books, 2006) at 31.

[131] *Protocol I*, *supra* note 72 art 51(4)(c); see also Marchant, *supra* note 31 at 283.

[132] Canning, "Armed Autonomous", *supra* note 1.

carrying an AK-47 because this is local cultural practice, from a hostile insurgent."[133] Demarcating the distinction between civilians and combatants is further complicated in context-dependent situations, such as a combatant wishing to surrender or a enumerated military target no longer posing sufficient threat to constitute a legitimate target.

Even if this threshold question were to be adequately addressed, others remain. Ugo Pagallo identifies five factors (including discrimination) that would need to be identified before a robot could legally engage a target. These factors, each deriving from a precept of international humanitarian law, are enumerated as follows:

> (1) responsibility of humans who grant use of autonomous lethal force;
> (2) military necessity in fixing criteria for the target;
> (3) discrimination of the target identified as a legitimate combatant;
> (4) principle of double intention so as to define tactics for engagement, approach and stand-off distance; and
> (5) proportionality in selecting weapon firing patterns.[134]

A mere glimpse at the overview of international humanitarian law set out above in Section III reveals that the intellectual and sensory processes required to engage and operationalize each of these factors are multi-faceted and richly layered. The balancing functions required by these complex norms are difficult to reconcile with the Boolean logic and other current argument schemes that robots employ in order to render decisions.[135] How would a robot properly assess the importance of a military target? In an international humanitarian law framework prescribing the assessment of proportionality as the intervening quality between principles of military necessity and humanity, the bar is set quite high, requiring the artificial intellect to assign three separate values and then correlate between three highly subjective variables. As Lin *et al.* astutely identify, this framework is considerably more complex than the simplistic hierarchy of Asimov's laws.[136] And, as the frequent

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[133] Robert Sparrow, "Building a Better WarBot: Ethical issues in the design of unmanned systems for military applications" (2009) 15 Science and Engineering Ethics 169 at 180.
[134] Pagallo, "Just War", *supra* note 43 at 11.
[135] Boolean logic is the calculation of truth values with equations that are true for every possible assignment of 0 or 1 to their variables. The generation of a logical conclusion is based upon the form of the equation. By contrast, argumentation theory expresses logical conclusions through argument schemes, which depends not only upon form but also upon "epistemological or pragmatic value." Particularly noteworthy in this context is Henry Prakken, a leader in the field of argumentation theory, who engages with questions of how logic could govern the operation of artificial intelligence. He asserts that form-based Boolean logic is insufficient for programming legal arguments. Thus, to appropriately program artificial intelligence to behave logically, the variables must be supplemented by argument schemes where decision-making depends more upon content. See Henry Prakken, "AI & Law, Logic and Argument Schemes" (2005) 19 Argumentation 303.
[136] Navy Report, *supra* note 5 at 76. The robots in Isaac Asimov's short stories are programmed to act in accordance with unbreakable laws, which are deemed to protect humankind from the spectre of a robo-takeover. The three laws first appear in Asimov's short story "Runaround," part of his seminal anthology *I, Robot.* These laws, in decreasing order of precedence, are as follows: "(1) A robot may not injure a human being or, through inaction, allow a human being to come to harm. (2) A robot

subversion of the robotic laws in Asimov's short stories reveals, the resolution of perceived conflicts between the norms within the framework can produce significant unanticipated results. Proportionality and military necessity are even more sophisticated, context-dependent concepts. Moreover, this does not account for challenges such emergent behaviours described by Ray Kurzweil: machine learning can generate unanticipated results.[137]

Kenneth Anderson describes the problem robots would encounter when assessing proportionality for *jus in bello* as a comparison of apples and oranges—an exercise in weighing incommensurate factors.[138] A decision heuristic based on simple inference would be inadequate for making complicated battlefield decisions; instead, robots would need to learn by doing and develop appropriate skills through practice.[139]

Even if roboticists are able to overcome many of the above challenges, programming robots to simply accord with international humanitarian principles may prove insufficient. Many nations that engage in warfare see these precepts as a minimum threshold; however, moral behaviour is usually thought to significantly surpass minimum standards. After all, mere adherence to the letter of international law conventions has the potential for catastrophic results. A rote application of bare minimum principles could justify significant loss of human life as collateral damage, while a more carefully crafted operation (or choosing not to undertake operations in light of the risks) could avoid that loss of life altogether.

Some proponents of lethal autonomous robots remain deeply convinced in the possibility of ethical programming that would not merely conform to but ultimately surpass the normative requirements of international humanitarian law. Arkin, for example, contends that case-based reasoning, already employed in other intelligent robotic systems, could prove useful in this regard.[140] He believes that such military applications would eclipse the performance of soldiers on the battlefield, and he writes in a recent progress report: "I am convinced that they can perform more

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must obey the orders given to it by human beings, except where such orders would conflict with the First Law. (3) A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws." In later Asimov works, a zeroth law that precedes the others is also posited, stating: "(0) A robot may not harm humanity, or, by inaction, allow humanity to come to harm." See generally Issac Asimov, *I, Robot*, (New York, Bantam Books, 1950).

[137] Emergent behaviour refers to the complexity that results when intelligence becomes self-organizing. Organized complexity that breeds such emergent behaviour is seen in mutations, natural selection, and evolution. Futurist Ray Kurzweil anticipates the same phenomenon will result when computers exceed human intelligence. Ray Kurzweil, *The Age of Spiritual Machines* (New York City: Viking Penguin, 1999).

[138] Kenneth Anderson, "The ethics of robot soldiers?" (4 July 2007) Kenneth Anderson's Law of War and Just War Theory Blog, online: <http://kennethandersonlawofwar.blogspot.com/2007/07/ethics-of-robot-soldiers.html>.

[139] *Ibid.*

[140] Arkin, "Governing", *supra* note 7 at 12.

ethically than human soldiers are capable of."[141] According to Arkin, the fact that robots might sometimes fall short of the standard of the laws of war does not mean that they are worse than humans. As discussed above, humans also fall short of this standard with what Arkin characterizes as "depressing regularity." [142] Using comprehensive system mapping and logical expressions, he describes the proposed functionality of lethal autonomous robots, including "architectural design options," that would inject moral reasoning capability into robots.[143]

It remains unclear how realistic the technological project of programming ethical compliance is in such a complex area of law. However, in our view, there are additional matters to consider.

B. The Normative Pull of Military Technologies

While roboethics is a fascinating and fast emerging field of study, an important but less well understood line of inquiry examines how international humanitarian norms are influenced and implicated through the adoption and use of military technologies.

Like the advent of the mechanical tomato harvester in rural Californian agricultural communities discussed above in Section IV, the introduction of a new military technology can reshape norms within military culture. Consider, for example, shifting standards in submarine warfare.[144] Humanitarian ideals have long informed the norms of naval warfare between surface vessels. Conflicts on the high seas were accompanied by standard responsibilities that aimed to preserve humanity in any altercations.[145] For example, military vessels were prohibited from attacking merchant ships and were instead required to capture and escort merchants to port. Likewise, after a naval battle, the successful vessels were required to rescue

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[141] *Ibid* at 7.
[142] Arkin, "Ethical", *supra* note 45 at 1.
[143] *Ibid* at 61.
[144] *1936 London Procès-Verbal Relating to the Rules of Submarine Warfare Set Forth in Part IV of the Treaty of London of 22 April 1930*, London, 6 November 1936, UKTS 29 (1936), Cmd. 5302 (Eng. Fr.) [*1936 London Protocol*]. Peter Asaro also uses this example to exemplify problems associated with lethal autonomous robots. See Peter Asaro, "How Just Could A Robot War Be?" in Philip Brey, Adam Briggle and Katinka Waelbers (eds), *Current Issues in Computing and Philosophy*, (Amsterdam: IOS Press, 2008) 50 at 59 [Asaro, "Robot War"]. However, this example originates in Walzer's seminal work on just war. As a corollary to the "sink on sight" unlimited submarine warfare practices employed by German forces during WWII, German submarines stopped following the duty set out in the 1936 London Protocol to provide for the safety of the survivors of a sunken ship. This was justified under the auspices of military necessity: submarines are exposed to great danger if they have to surface and fulfill the obligations of surface vessels. The argument was made that the only alternative was to not use submarines at all or to use them ineffectively, which would have given control of the sea to the British navy. Michael Walzer, *Just and Unjust Wars* (New York City: Basic Books, 1977) at 147.
[145] *Ibid.*

survivors by bringing them aboard.[146] The 1930 London Naval Treaty and its 1936 successor codified the law in this area.[147]

The historical example of the submarine illustrates the vulnerability of technological neutrality: as norms evolve and nations point to state practice to justify actions that stray away from—or are even in direct contravention of—international agreements, such conventions run the risk of becoming "blue law."[148] Customary international law may purport to fill this vacuum; yet since international law depends on the development of norms based on the behaviour of sovereign nation states, law can be transformed by a collective omission or new practice. And this can be achieved through the introduction of a new technology that "forces" new practices.

The 1936 London Naval Protocol reaffirmed that submarines had the same duties as surface vessels.[149] Consequently, submarines had a responsibility to comport with the longstanding obligations imposed on ships.[150] Attempting to follow these rules was not only impractical for submarines but also had the effect of imposing near impossible responsibilities. Lacking comparable crews to surface vessels, accompanying a merchant ship to port was not something submarines could feasibly do. Moreover, during World War II, German submarines were relegated to great depths for both their own safety and strategy since the Allied Forces controlled the surface.[151] Even if a submarine were to surface after a battle, the space constraints in a small cabin scarcely large enough for the existing crew and machinery meant that taking on two or three more people was out of the question.[152]

The most fundamental incompatibility between submarine operation and the constraints imposed on surface vessels went to the core of naval strategy: submarines were intended for stealth. They were used in situations where stealth was paramount. Surfacing would negate the defined military objective for which they were deployed. Before long, in the tumultuous context of the Second World War, any assumption that submarines would comport with the Second London Naval Treaty disappeared. Accordingly, the treaty fell into disuse. New norms around the behaviour of submarines emerged that were based on the way submarines were already being used in warfare. These norms were predicated—at least in part—on the way the technology had been designed.

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[146] Jane Gilliland, "Submarines and Targets: Suggestions for New Codified Rules of Submarine Warfare" (1984) 73 Geo LJ 975 at 981.
[147] *Ibid* at 978; *1936 London Protocol*, *supra* note 144.
[148] Jane Gilliland describes a blue law as being one which is both clear on its terms and be clearly violated by an accused, but is unenforced because of changed conditions and long-term disregard by the community. *Ibid* at 989.
[149] *1936 London Protocol*, *supra* note 144.
[150] Gilliland, *supra* note 146 at 989.
[151] *Ibid* at 981.
[152] *Ibid.*

Although the submarine did not unilaterally undermine the humanitarian requirements of the high seas, the very design of submarine technology did determine its own use with respect to those rules. Though such an outcome may well have been serendipitous (its not like submarines were purposefully built to get around these rules), this example illustrates that international humanitarian norms can indeed be circumvented by design. In at least some instances, a state could avoid humanitarian obligations by implementing a technology that is said to fulfill an important military objective whose very operations would be undermined by complying with the norm.

Jane Gilliland cautions, "the law of armed conflict for submarines subrogates military necessity to humanitarian goals, and in so doing threatens the achievement of the humanitarian goals it seeks to protect."[153] The submarine example, which transpired in a world not yet constrained by international humanitarian law, showcases how the advent of new technology may sculpt international norms as what is easily practicable with the technology employed becomes the new widespread practice. Since international law is formed, to some degree, on the basis of state practice, this is troubling. The codifications that later occurred took into account the practices that had already unfolded on the battlefield. Failing to account for technological change thereby weakens the staying power of the codification of international law.

Of course, one could also imagine a very different and much more humane historical outcome for the submarine. The fact that submarine vessels cannot easily rescue overboard combatants (who likely came to be that way because of the torpedo fired at them by the submarine) might just as easily be understood as a reason against their deployment rather than a reason in favour of excusing submarines from otherwise enforceable humanitarian obligations. In part, what history tells us is that the case in favour of military necessity is a strong one and that the technologies said to be necessary in carrying out important military objectives are not easily interfered with.

C. Lethal Autonomous Robots as a Force Multiplier of Military Necessity

Both the submarine and the mechanical tomato harvester were game changers in terms of what was subsequently seen as necessary and proportional in naval battle and tomato agriculture. The basic mechanism in each case was previously explained in Section IV above: when a disruptive technology changes the nature of what is possible, it also expands the scope of inclusion for what can prospectively be perceived of as "necessary."[154] The consequences of this for international law are

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[153] *Ibid* at 991.

[154] Better prediction technology makes possible an argument that pre-emption is necessary. For instance, the much maligned "Bush doctrine" justifies pre-emptive self-defence in the context of the "War on Terror" through advanced technological prediction capability that better informs government agencies about the threat of a terrorist attack. In his first public speech on the topic at a graduation ceremony at West Point, Bush stated: "If we wait for

significant. If norms can be shifted in a manner mandated by the technology, then its potential to transform international law—*where practice becomes principle*—is enormous.

The power to induce a shift in norms in this way has led many academics to register concern about technology's influence over international law. Colin Picker expresses his worry as follows:

> Perhaps most problematic is the [fact] that technology is a determinate force that acts as an invisible hand creating, shaping and destroying international law. Failure to handle such a powerful force will result in policy makers essentially abdicating the international regime to technology.[155]

With many references peppered throughout his article to "the invisible hand of technology,"[156] Picker seems at first blush to be suggesting that the appropriate underlying philosophical worldview for international law is technological determinism—the idea that technology determines social outcomes.[157] Picker later explicitly denies this, claiming: "I am not arguing, however, in favor of technological determinism. Technological determinism implies a stronger and more comprehensive relationship between technology and international law than I would assert exists. Policy makers can ignore technology, but at a tremendous cost."[158]

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threats to fully materialize, we will have waited too long. … We must take the battle to the enemy, disrupt his plans, and confront the worst threats before they emerge...our security will require all Americans to be forward-looking and resolute, to be ready for preemptive action when necessary to defend our liberty and to defend our lives." See United States Military Academy, "President Bush Delivers Graduation Speech at West Point" (1 June 2002), online: The White House, <http://georgewbush-whitehouse.archives.gov/news/releases/2002/06/20020601-3.html>. See also The White House, *The National Security Strategy of the United States of America,* (Washington: The White House, 2002) at 14-15.

[155] Colin Picker, "A View from 40,000 Feet: International Law and the Invisible Hand of Technology" (2001) 23 Cardozo L Rev 149 at 151 [Picker, "View"].

[156] As Colin Picker explains: "The fact that modern communications technology is forcing policy makers to take global constituencies into account is a reflection of a perception that technology is an irresistible force. This is not a new insight. Indeed, thirty years ago, L.F.E. Goldie argued that "the sciences are all-pervasive in international law … and have a direct condition, if not determinative, effect both upon existing rules and upon the progressive development of new rules." This insight is analogous to Adam Smith's metaphor of the role of the invisible hand of the market on a country's economy. In the technology and international law context, the metaphor would observe that technology operates as an invisible hand on international law, guiding and shaping its development." *Ibid* at 201.

[157] The phrase "technological determinism" was reportedly coined by economic industrialist Thorstein Veblen. See Thorstein Veblen, *Engineers and the Price System* (Batoche Books: Kitchener, 2001) at 38. For a fulsome survey of philosophers with varying view on technological determinism, see Bruce Bimber, "Karl Marx and the Three Faces of Technological Determinism" (1990) 20 Social Studies of Science 333.

[158] Picker, "View", *supra* note 155 at 203.

Our position is somewhat different. To us, it is not as though the invisible hand of technology magically removes all other social outcomes or possibilities, or that "it" somehow punishes those who do not respond accordingly with heavy costs. Rejecting this strange metonym, we believe that a more telling metaphor explaining the nexus between technology and norms is the one ultimately adopted by Langdon Winner:

> A more revealing notion, in my view, is that of technological somnambulism. For the interesting puzzle in our times is that we so willingly sleepwalk through the process of reconstituting the conditions of human existence.[159]

It is not that technology actually compels us to adopt certain norms (or that it actually puts us into a sleep-like trance). Rather, our social uses of technology can reconstitute our preceptions so that we will not easily experience other existing possibilities.[160] "Of course we need new breeds of (tasteless) tomatoes—how else would we efficiently harvest them?" "Of course we cannot require submarine pilots to save overboard enemy combatants (whose boats they have blown apart)—how otherwise would they effectively carry out their missions?"

It is perhaps trite to say that international law was intentionally constructed to provide an extremely flexible framework.[161] Picker's more interesting claim is that a primary reason for doing so is to accommodate the protean nature of technology. Like the more recent technology-neutral frameworks used in electronic commerce and data protection law (both of which are derived domestically from international models), the core design of international humanitarian law is consistent with promoting, rather than restricting innovation. On this approach, we do not restrict innovation, only its particular uses. While the technology in question is itself conceived of as neutral, the framework said to regulate it is not: it is designed to encourage and accommodate the overall use of technology.

When value-neutral approaches are applied to deeply value-laden technologies, the results can be disingenuous. Recall that the four *Geneva Conventions* underlying

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[159] Winner, "Forms of Life", *supra* note 128 at 107.
[160] Neil Postman, *TECHNOPOLY: The Surrender of Culture to Technology*, (New York: Vintage Books, 1993).
[161] The multiple sources of international law in the ICJ Statute, which include treaty law, customary law, general principles of law recognized by civilized nations, and judicial decisions and writings of highly qualified publicists demonstrates that international law is not intended as a single behavioural code, but instead as a flexible entity that recognizes a pluralistic legal perspective. See *Statute of the International Court of Justice*, June 26, 1945, 59 Stat 1055, art 38(1). Moreover, the creation of assumedly concrete and binding treaty law is accompanied by planned review conferences to determine whether the scheme is sufficient and whether changes are necessary. For example, the though the Rome Statute came into force in 2002, a review conference was mandated for seven years later to propose and discuss amendments to flexibly respond to its implementation. See International Criminal Court, "The Review Conference for the Rome Statute", online: <http://www.kampala.icc-cpi.info/>.

international humanitarian law were concluded in 1949. Animating this process was not only the aftermath of WWII, but the spectre of weaponization in the newly arrived nuclear age. The process was concluded on 12 August 1949, less than a month after the then-USSR test detonated its first nuclear weapon.[162] Yet, efforts to categorically prohibit such weapons of mass destruction were met with resistance. Unlike previous consensus over combat gases and biological weapons, the international community was unable to establish the political will to prohibit the development of nuclear arsenals.[163]

It was not surprising—in the golden age of technological neutrality[164]—to see that very approach adopted by the International Court of Justice (ICJ) in its *Advisory Opinion on the Legality of Nuclear Weapons*.[165] Unsatisfied with the international community's failure to clarify the legality of nuclear weapons, the World Health Organization had asked the ICJ to adjudge on the legality of using nuclear weapons. The ICJ was resistant to the idea that one technology could be expressly forbidden and instead clung to the precepts of international law: the weapon itself was not illegal, the acts that could be committed with that weapon were what was illegal.[166] And provided the weapon was used in a manner that satisfied the legal test for proportionality, discrimination and military necessity, there was no need to outlaw it outright. The Court discarded arguments put forward by states that suggested that "nuclear weapons would be illegal in any circumstances owing to their inherent and total incompatibility with the law applicable in armed conflict"[167], instead stating that:

> … the principles and rules of law applicable in armed conflict—at the heart of which is the overriding consideration of humanity—make the conduct of armed hostilities subject to a number of strict requirements. Thus, methods and means of warfare, which would

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[162] Kim Gordon-Bates, "The ICRC and the nuclear weapon: the story of an uncomfortable paradox" 18 March 2003, online: ICRC <http://www.icrc.org/eng/resources/documents/misc/5krbdw.htm>.
[163] *Ibid.*
[164] The mid-1990s also saw international action towards the creation of technology neutral e-commerce legislation. Though there was an identified need to regulate electronic commerce, the international community remained reticent to the development of specific standards due to the propensity of the technology to change rapidly and the possibility of legislative obsolescence before the provisions even came into force. Moreover, an international agreement could only function if countries the world over, with different technologies in practice, would agree to a convention. The United Nations Model Law on Electronic Commerce therefore adopts a minimalistic, technology-neutral approach. See *Official Records of the General Assembly, Fortieth Session, Supplement No. 17 (A/40/17)(1996)*. Concurrently, global data protection regimes also began to gain similar momentum, with the prevailing attitude being that policies needed to be technology neutral to withstand the test of time. The European data privacy directive, Directive 95/46/EC, was adopted in 1995. See "Legislation", European Data Protection Supervisor, online: <http://www.edps.europa.eu/EDPSWEB/edps/EDPS/Dataprotection/Legislation>.
[165] *Legality of the Threat or Use of Nuclear Weapons*, Advisory Opinion, [1996] ICJ Rep 226 [*Nuclear Weapons*].
[166] *Ibid* at ¶¶74-87.
[167] *Ibid* at ¶95.

> preclude any distinction between civilian and military targets, or which would result in unnecessary suffering to combatants, are prohibited. In view of the unique characteristics of nuclear weapons … the use of such weapons seems scarcely reconcilable with respect for such requirements. Nevertheless, the Court considers that it does not have sufficient elements to enable it to conclude with certainty that the use of nuclear weapons would necessarily be at variance with the principles and rules of law applicable in armed conflict in any circumstance.[168]

Despite the inherent flexibility of international humanitarian law, it is still difficult to imagine circumstances in which the use of a nuclear weapon could satisfy its norms. Nuclear weapons will, in their present form, be consistently unable to discriminate between civilians and combatants. Accordingly, any use of a nuclear weapon that satisfies the criterion of distinction would be an operation calculated to annihilate an entire area. As we have seen, such an act is clearly inhumane and almost certainly disproportionate to any act it purportedly responds to.[169] Moreover, and perhaps even more troubling, allowing a nuclear weapon to remain within the *arsenal of possibility* might permit its use to be justified prospectively under the guise of military necessity in subsequent situations. As Justice Higgins describes in the *Nuclear Weapons* decision, questions of numbers of casualties or inflicted suffering "must be resolved as part of the balancing equation between the necessities of war and the requirements of humanity."[170]

With all of this, we see that the framework for balancing international humanitarian norms is sufficiently malleable to permit destruction and lethal force. While it is true that any military action must be constrained within the parameters of a proportional response, the overall potential for destruction is unquestionably augmented by the existence of certain destructive and lethal technologies with advanced capabilities.

As an illustration, let us imagine these norm-conflicts along a continuum. At one end of the continuum are outcomes premised solely on humane or humanitarian grounds (the principle of humanity). At the other end are outcomes that focus exclusively on carrying out destructive or lethal military objectives (the principle of military necessity). Somewhere in the middle, where these two norms are in direct conflict, the adoption of a new technology is often sought as a military solution.[171]

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[168] *Ibid*.
[169] Conceivably, one might argue that it would be proportionate to use a nuclear weapon in response to another nuclear attack.
[170] *Nuclear Weapons*, *ibid*, Dissenting Opinion of Judge Higgins at ¶¶14, 20.
[171] The case for lethal autonomous robots set out above in Section II provides an excellent example of this.

But the introduction of such a technology is often (to use a military metaphor) a "force multiplier"[172] of military necessity. As we suggested in our Kosovo example and with the subsequent questions raised by lethal autonomous robots, the ability to capitalize on military possibilities created by such technologies raises the stakes in terms of possible military objectives and operations that were unfathomable prior to the emergence of the technology. This allows us to "sleepwalk" towards a perspective that sees various uses of these technologies as a military necessary for resolving present and future armed conflict, even if they result in more death and destruction.

There is an interesting connection here between the concept of military necessity and the worldview of technological determinism that we reject. If one listens closely to the justifications often given in support of the military necessity in the use of a particular technology, there is a false strand of determinism running through it. The ICJ commits this very fallacy in contemplation of a situation wherein a State's "very survival would be at stake", anticipating that nuclear weapons may be the only recourse in "an extreme circumstance of self-defence."[173] It is this deterministic thread built into the very fabric of military necessity that makes it a force multiplier.

How might this show itself in the case of lethal autonomous robots?

In its most utopian form, Robowar seeks to remove humans from battlespace, anticipating fewer people fighting and fewer casualties. Of course, in almost all conceivable situations, casualties would of course remain—it is only friendly casualties that are reduced by replacing one side's soldiers with robots. Failing to acknowledge this reality risks callousness in attack. Either way, the existence of lethal autonomous robots will surely be a force multiplier of military necessity in terms of the general military objective of reducing friendly casualties. "If we have expendable mechanical mercenaries that we can send into battle instead of our children, how could we *not* do so?"

Of course, once we do so, the use of lethal autonomous robots will have a profound effect of lowering the threshold for entry into war: war will be (domestically) perceived of as easier both politically and logistically if there are fewer people involved. Fewer soldiers need to be recruited and fewer deaths have to be justified to win public support of the war effort. As Pagallo astutely identifies, autonomous robots have a double effect: they impact the traditional *jus in bello* rules for a fair fight on the battlefield while the capacity of the technology simultaneously influences a nation's political decision to go to war.[174] Again, one can view this as a

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[172] The term "force multiplier" refers to a factor that significantly enhances the effectiveness or strategic advantage of a particular force. In a military context, technology can result in force multiplication that achieves an objective that would traditionally have required a much larger force. Arkin expects lethal autonomous robots would result in force multiplication by having robots and soldiers side-by-side on the battlefield. See Arkin, "Governing", *supra* note 7 at 13.

[173] *Nuclear Weapons*, *supra* note 165 at ¶96.

[174] Pagallo, "Just War" *supra* note 43 at 303.

force multiplier of military necessity. "If we have robots on the ground that can carry out an important military operation with few or no friendly casualties, why *wouldn't* we engage the enemy on this mission?"

To the extent that lethal autonomous robots will still interact with human military collaborators, the force multiplier of remote controlled warfare can also have individual psychological affects on the soldiers engaged in it, increasing sympathy for military objectives and military necessity by minimizing our empathy regarding circumstances no longer seen through the lens of humanitarian ideals.[175] Today's warriors often fight from some cubicle, operating aircraft remotely, and developing a "Playstation mentality" with regard to the waging of war.[176] Recent YouTube footage of Predator drone attacks set to music and shared and celebrated amongst soldiers online further distances the acts from the actors.[177] Increasing both the physical and psychological distance between soldiers and their targets not only dampens respect for human life—it also makes it easier to follow military objectives, especially those perceived of as necessary. After all, those being killed are only ever encountered as pixels on a screen.

This asymmetric element of modern warfare is not only dangerous, it also conceptually challenges the foundations of war by skewing the balance between humanitarian ideals and military necessity. How does the very nature of conflict change if one side's soldiers are never actually in danger? It is already the case that an American solider can serve an entire tour of duty in Afghanistan or Iraq, work 16-hour days, and still eat lunch every day at Carl's Jr. just outside the gates of his or her Nevada Air Force base.[178] While it may be appealing to imagine being at war with an enemy without experiencing casualties, it also solicits a larger question: if one side has no people in harm's way, is it truly a war?[179] And, more to the point for present purposes, without a significant level of human investment, will that side be able to see, understand, and inculcate the humanitarian norms in tension during battle? The advent of lethal autonomous robots has the potential to greatly exacerbate these risks in a manner that could be profoundly destabilizing to the framework of armed conflict.

VI. International Humanitarian Somnambulism?

Despite the length and complexity of this article, our conclusions are in fact quite modest. We have not speculated about the future uses of lethal autonomous robots.

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[175] See *e.g.* Singer, "Wired", *supra* note 10; Asaro, "Robot War"*supra* note 144; Sparrow, "Killer", *supra* note 11; van Wifferen, *supra* note 19.
[176] van Wifferen*, supra* note 19 at 38.
[177] These videoclips, many of which are freely available on YouTube, are colloquially known as "war porn." Peter Singer cites a particularly egregious example of a clip of catastrophic explosions being set to the song "I Just Wanna Fly" by Sugar Ray. See Singer, "TED", *supra* note 40.
[178] Singer, "Wired" *supra* note 10 at 85.
[179] The Economist, "Robots at war: Drones and democracy" (1 October 2010), online: The Economist <http://www.economist.com/blogs/babbage/2010/10/robots_war>.

We have not argued in favour of or against their adoption. And, we have not conjectured about whether their adoption might ever comport with the norms of international humanitarian law.

Instead, our analysis has focused solely on one means by which such technologies might be regulated. In considering the current military use of semi-autonomous machines and the case in favour of employing lethal autonomous robots in the future, we have examined international humanitarian law and have drawn some conclusions regarding its potential use in preventing unjustifiable military death and destruction by lethal autonomous robots.

We have suggested that it is crucial to recognize the philosophical underpinnings and implications of international humanitarian law's purportedly technology-neutral approach. Though this framework treats each technology under consideration as though it is neutral, the framework encourages and accommodates the development and use of emerging technologies. We believe that a failure to recognize and unpack the values embedded into the design of the framework itself, let alone those embedded in the robotic technologies under consideration, can lead to a mistaken and deterministic mode of thinking that fallaciously treats unjustifiable, lethal operations as though they are a military necessity. We have offered a possible explanation for how this might occur: when a disruptive technology changes the nature of what is possible, it also expands the scope of inclusion for what can prospectively be perceived of as "necessary" in carrying out military objectives.

Whether it turns out that we are right or wrong in offering this explanation, it is our hope that this article and its examination of how technologies imbue (and are imbued with) values creates space for alternative conceptions of regulating the military use of lethal autonomous robots.

Although we have neither discussed nor evaluated potential alternatives, many exist. Sector specific frameworks are possible, as are conventions limiting or restricting the use of lethal autonomous weapons. There is precedent for international agreements to emerge from non-governmental advocacy.[180] Some have advocated for a United Nations sponsored international agreement.[181] Such suggestions are not implausible. In a 2010 report to the United Nations General Assembly, Christof Heyns, the UN Special Rapporteur on Extrajudicial Executions, questioned whether

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[180] The *1997 Ottawa Convention on the Prohibition of the Use, Stockpiling, Production, and Transfer of Anti-Personnel Mines and on Their Destruction* was spurred by the dedicated efforts of civil society organizations worldwide. Notable activists within the movement included Diana, Princess of Wales, Canadian Foreign Minister Lloyd Axworthy, the International Campaign to Ban Landmines (ICBL, website: www.icbl.org/intro.php), a global network that was awarded the Nobel Prize for its efforts to bring about the treaty. See generally Kenneth Anderson, "The Ottawa Convention banning landmines, the role of international non-governmental organizations and the idea of international civil society" (2000) 11 EJIL 91.

[181] Pagallo, "Just War", *supra* note 43 at 322.

lethal force should ever be able to be truly automated.[182] Both Heyns and his immediate predecessor, Philip Alston, have recommended that the UN Secretary General engage experts to evaluate possible parameters and conditions to restrain robot soldiers and recommend whether certain types of autonomous systems should be categorically unlawful.[183]

Currently agnostic with regard to which, if any, of these frameworks might emerge as most suitable, we have merely sought to demonstrate in this article that an exclusive reliance on the norms of international humanitarian law to regulate roboticized warfare hazards increasing the trajectory of anti-humanitarian outcomes under the guise of military necessity. Permitting such a fictitious and fallacious treatment of lethal autonomous robots ultimately risks the very same somnambulism that would seek to promote humanitarian ends by taking humans out of the loop.

[182] General Assembly GA/SHC/3986 Sixty-fifth General Assembly Third Committee 26th & 27th Meetings (AM & PM) online: <http://www.un.org/News/Press/docs/2010/gashc3986.doc.htm>
[183] Pagallo, "Just War", *supra* note 43 at 321.