Autonomous Weapon Systems, Human Dignity and International Law

Saxon, D.R.

Chapter One

Autonomous Weapon Systems, Human Dignity and International Law

Introduction

I. Problem Statement and Propositions

This dissertation attempts to contribute to the growing legal and philosophical debate concerning the design, development and employment of lethal autonomous weapon systems. Much of this debate speaks to two fundamental and related problems: 1) How, if at all, can states and non-state actors use lethal autonomous weapons in accordance with international law? and 2) When an autonomous weapon system takes a human life, is that killing a violation of human dignity?

For the purpose of this dissertation, I define 'autonomous weapon system' as a 'weapon system that, once activated, can select and engage targets without further intervention by a human operator.'[1] In addition, this dissertation will focus (most of) its attention on autonomous weapon systems that have the capacity to inflict lethal force because such autonomous weapons present the most complex and contentious legal and moral issues.

This dissertation contributes to the scholarly debate by describing a new framework to consider the relationship between human dignity, responsibility,[2] autonomy and international

[1] A Carter, 'Autonomy in Weapons Systems,' *Department of Defence Directive*, United States of America, Number 3000.09 (21 November 2012). This definition 'includes human-supervised autonomous weapon systems that are designed to allow human operators to override operation of the weapon system, but can select and engage targets without further human input after activation.' *Ibid*, 13 – 14. The U.K. armed forces employ a more cognitive-based definition of 'autonomy.' According to U.K. military doctrine, an 'autonomous system is capable of understanding higher level intent and direction. … As such they must be capable of achieving the same level of situational awareness as a human.' An 'automated' or 'automatic' weapon system, however, is one that, in response to inputs from one or more sensors, is programmed to logically follow a pre-defined set of rules in order to provide a predictable outcome.

[2] The whole of our common morality, observed Isaiah Berlin, presupposes the notion of responsibility. 'My Intellectual Path,' in *The Power of Ideas*, H. Hardy (ed.) (Princeton University Press, 2000), p. 20.

law. It uses technology to illuminate some of the strengths and weakness of international law in modern times.[3] I make the following four propositions:

1. As the speed of operations of autonomous weapon system increases, the use of these weapon systems will undermine the opportunities for, and the value of, human reason and thinking;

2. When the use of autonomous weapon systems undermines the value of human reason and thinking (i.e. personal autonomy), the killing of human beings by autonomous weapon systems will constitute a violation of human dignity and, therefore, international law;

3. The use of autonomous weapon systems will undermine the function of law and the application of law;

4. The design of autonomous weapon systems must have an interdependent, 'co-active' design in order to reduce the speed of autonomous weapon systems to a velocity where individuals can i) comply with law (in particular international humanitarian law and international human rights law) and (ii) ensure that human reasoning and judgment is available for cognitive functions better suited for humans than machines.

In order to support these propositions, this dissertation examines a common assumption and three related omissions evident in the academic literature concerning lethal autonomous weapon systems. The (incorrect) assumption is that important questions about the lawfulness and morality of autonomous weapon systems depend on definitions of semantic standards

[3] 'To be master of any branch of knowledge, you must master those which lie next to it ….' O Holmes, 'The Profession of the Law,' in *Speeches by Oliver Wendell Holmes* (Boston: Little, Brown, and Company, 1896), p. 23.

about their design and use. Furthermore, the legal literature does not contain clear explanations of the technical characteristics and capacities of these weapons.[4] In addition, the literature fails to incorporate a more foundational review of the concepts of human dignity and the function of law, and their relevance to autonomous weapon systems. Much of the literature also omits an important discussion about the pressures of speed and time on the development and use of autonomous weapons, as well as suggestions for the kind of design that might address these issues.

As autonomous weapon systems communicate with each other and engage targets within microseconds, the delegation of power and responsibility for war-fighting from humans to machines inevitably must increase. Therefore, I conclude that it is the speed of autonomous weapon systems, and not their autonomy *per se*, which presents the greatest challenge for the protection of human dignity, the function of law, and the duties imposed by international law. I argue that the crucial question about the design, development and employment of these systems is not whether a human or a machine should make the decision to use lethal force. The essential question is whether there are certain responsibilities of human reasoning that we should not delegate to machines.[5] The central thesis of this dissertation is that the delegation of human responsibility for complex, value-based judgments to autonomous weapon systems erodes human dignity and, consequently, international law.

[4] To date, one of the strongest efforts to fill this gap is P Margulies, 'Making Autonomous Weapons Accountable: Command Responsibility for Computer-Guided Lethal Force in Armed Conflicts,' in J Ohlin (ed.) *Research Handbook on Remote Warfare* (Northampton: Edward Elgar Press, Forthcoming 2016).

[5] In this sense, 'responsibility' refers not only to processes of accountability, but also to obligations 'to act formatively toward society, when we have the responsibility for establishing, changing or taking steps to preserve particular forms of social order,' including laws, agreements institutions and social arrangements that shape human relations. L Fuller, 'Freedom – A Suggested Analysis,' 68 *Harvard Law Review* (June 1955), 1305, 1308.

II. Historical Background

Weapon systems 'are as old as warfare.'[6] The Chinese, for example, presumably invented the simple but innovative foot stirrup in the fifth century A.D. and it was carried to Western Europe by the eighth. Prior to the introduction of the stirrup, warriors sat precariously on their horses and risked a fall from their mount each time they slashed or lunged at their enemy.[7] The stirrup permitted a powerful new system of horse, rider and the sword, spear or lance that he carried.[8] The new technology provided additional lateral support to the person in the saddle and bonded horse and rider into a fighting unit capable of unprecedented violence: '[t]he fighter's hand no longer delivered the blow; it merely guided it. The stirrup thus replaced human energy with animal power, and immensely increased the warrior's ability to damage his enemy. Immediately, without preparatory steps, it made possible mounted shock combat, a revolutionary way of doing battle.'[9] The introduction of this 'alien military technology' in Europe also led to dramatic social changes such as the development of feudalism and 'the seeds of chivalry.'[10]

Like a mounted warrior from pre-medieval times, a modern foot soldier is also a 'weapon system.'[11] 'Rifles,' for example, 'are as good as the men who pull the triggers. Each soldier must consider his weapon in the same light as he considers his right arm;

---

[6] A Roland, 'Technology and War: A Bibliographic Essay,' in Meritt Roe Smith (ed.), *Military Enterprise and Technological Change: Perspectives on the American Experience* (Cambridge Massachusetts: The MIT Press, 1985), pp. 375. Historians of technology define 'systems' as 'interacting components coordinated by a common purpose – intellectual, economic, political or other.' T Hughes, 'Convergent Themes in the History of Science, Medicine and Technology', 22 *Technology and Culture*, 3 (July 1981), 550, 554.

[7] Without the assistance of stirrups, riders needed extensive training in how to grip the sides of the animal with their thighs. V Hanson, *A War Like No Other: How the Athenians and Spartans Fought the Peloponnesian War* (New York: Random House, 2005), p. 223.

[8] L White, Jr., *Medieval Technology and Social Change* (Oxford: The Clarendon Press, 1962), p. 2.

[9] *Ibid*.

[10] *Ibid*, pp. 28 – 38. Similarly, the introduction of firearms and artillery transformed inter-state warfare, economic relations 'and the capitalist organisation of arms production.' F Braudel, *Capitalism and Modern Life: 1400 – 1800*, M Kochan (trans.) (New York: Harper & Row, 1973), p. 291. For a discussion of the 'underlying connections between military developments and social change,' see M Howard, *War in European History* (Oxford: Oxford University Press, 2009), pp. 94-115.

[11] G Corn, remarks at 'Autonomous Weapon Systems – Law, Ethics and Policy,' Conference at European University Institute, Academy of European Law, 24 April 2014.

together they are a team.'[12] As rifle technology advances, soldiers change their tactics so that the system functions more effectively.[13]

Historically, 'battle' for the common soldier and the system that he represented was often a series of myopic, small-scale scenarios that were fought by their own rules.[14] Infantry actions, for example, were 'the sum of many combats of individuals - one against one, one against two, three against five.'[15] Thus, it is not surprising that, as part of a vivid description of the efforts by United States Marines to occupy the island of Iwo Jima during the Second World War, military historian Max Hastings observed that ' … all battles break down into a host of intensely personal contests…'[16]

During the nineteenth and twentieth centuries, however, that truism already had begun to change.[17] The development of the machine-gun 'put into the hands of one man the fire-power formerly wielded by forty.'[18] New kinds of heavy artillery, 'perhaps the decisive weapon on the battlefield'[19] in World War I, made long-range shelling a crucial part of combat strategy. Prior to the start of the battle of the Somme on 1 July 1916, for example, U.K. and French forces stockpiled nearly three million artillery shells that fed a seven-day (and night) bombardment of the German lines, before the first infantry soldiers climbed over

---

[12] J Weller, *Fire and Movement: Bargain-Basement Warfare in the Far East* (New York: Crowell, 1967), p. 133.
[13] Howard, War in European History, p. 102.
[14] J Keegan, *The Face of Battle* (New York: Penguin Books, 1976), p. 47. B Mitchell (ed.), *The Battle of Maldon and Other Old English Poems* (London: MacMillan, 1974), pp. 28 – 38.
[15] *Ibid*, p. 100.
[16] M Hastings, *Nemesis: The Battle for Japan, 1944-45* (Harper Perennial, 2007), p. 277. Similarly, writing in the nineteenth century, Prussian Field-Marshal General Count Helmuth von Moltke observed that in war, 'everything must be individual.' 'Letter, 11 December 1880' in T Holland (ed.), *Letters to 'The Times:' Upon War and Neutrality with Some Commentary* (New York: Longmans, Green and Co., 1914).
[17] In 1862, a military theorist opined that the 'means of destruction are approaching perfection with frightful rapidity. The Congreve rockets, the effect and direction of which it is said the Austrians can now regulate,—the shrapnel howitzers, which throw a stream of canister as far as the range of a bullet,—the Perkins steam-guns, which vomit forth as many balls as a battalion,—will multiply the chances of destruction, as though the hecatombs of Eylau, Borodino, Leipsic, and Waterloo were not sufficient to decimate the European races.' Baron de Jomini, *The Art of War*, G.H. Mendell and W.P. Craighill (trans.) (West Point: U.S. Military Academy, 1862), pp. 48, <http://www.gutenberg.org/files/13549/13549-h/13549-h.htm#ARTICLE_XII>.
[18] Keegan, The Face of Battle, p. 232.
[19] Howard, War in European History, p. 104.

their trench-tops and into no-man's land.[20] As time progressed, with the development of increasingly mechanised armoured forces during World War II and the Cold War, the common soldier experienced a steep 'reduction of his status to that of a mere adjunct to machinery, the software'[21] in the system.

Today, in the twenty-first century, this trend continues and at a faster pace. The United States Department of Defence, for example, treats the virtual and anonymous environment of cyberspace as a new domain of warfare, subject to offensive and defensive military operations.[22] Furthermore, one third of essential US military aircraft and ground vehicles presently deployed should be unmanned[23] and 'military robots' – controlled by computer software code that we call 'artificial intelligence' – may outnumber manned weapons systems by 2030.[24] The F-35, the next generation jet fighter plane, 'almost certainly will be the last manned strike fighter aircraft the [U.S.] Department of the Navy will ever buy or fly.'[25] The technology for fully autonomous offensive weapons systems is available and

[20] *Ibid*, p. 216. During this bombardment, the allies fired 1,500,000 shells. *Ibid*, p. 235. This extended artillery attack occurred despite the fact that the British and French enjoyed a 7 – 1 superiority in infantry numbers. M Middlebrook, *The First Day on the Somme: 1 July 1916* (London: Penguin Books, 1984), pp. 75 and 78

[21] Keegan, The Face of Battle, p. 340.

[22] W J Lynn, III and N Thompson, 'The Pentagon's New Cyberstrategy,' Foreign Affairs, 1 October 2010, <http://www.foreignaffairs.com/discussions/news-and-events/foreign-affairs-live-the-pentagons-new-cyberstrategy> accessed 15 August 2012. Dr. Heather Harrison Dinniss describes the cyberspace domain as 'a medium where anonymity is the norm and distance and proximity are largely irrelevant.' 'Participants in Conflict – Cyber Warriors, Patriotic Hackers and the Laws of War', in D Saxon (ed.), *International Humanitarian Law and the Changing Technology of War* (Leiden: Martinus Nijhoff/Brill, 2013), p. 252.

[23] J Beard, 'Law and War in the Virtual Era', 103 *American Journal of International Law*, 3 (2009), 409, 413. The United States military presently operates over 8,000 remotely-controlled unmanned aircraft systems and over 12,000 unmanned ground systems. B Hoagland, 'Manning the Next Unmanned Air Force: Developing RPA Pilots of the Future', Policy Paper, Centre for 21st Century Security and Intelligence (August 2013), 1.

[24] A Krishnan, *Killer Robots: Legality and Ethicality of Autonomous Weapons* (Surrey: Ashgate Publishing, 2009), p. 88.

[25] S LaGrone, 'Mabus: F-35 Will Be 'Last Manned Strike Fighter' the Navy, Marines 'Will Ever Buy or Fly,'' U.S. Naval Institute News, 15 April 2013, <http://news.usni.org/2015/04/15/mabus-f-35c-will-be-last-manned-strike-fighter-the-navy-marines-will-ever-buy-or-fly>.

in use today.[26] The increasing computerisation and impersonalisation of the modern battlespace relegates many soldiers and commanders to mere *adjuncts to the software*.[27]

The legality, benefits and dangers of autonomous weapon systems are the subject of current debate amongst a relatively small but growing number of professionals including military personnel, scientists, diplomats, ethicists, policy-makers, philosophers and lawyers.[28] As Professor Schmitt observes, autonomy in combat is still 'in its infancy.'[29] Thus, the focus of this dissertation will not rest on the military technologies of the past but on the present and future use of the computer-guided machines that, in general terms, are known as 'autonomous weapon systems.'[30] The great challenge for weapons developers, military professionals, government officials and lawyers for the remainder of this century will be to ensure that the design and use of autonomous weapon systems accord with international law.

This dissertation, therefore, primarily is what Immanuel Kant called 'a history of future times, i.e. *a predictive* history.'[31] As a predictive *legal* history, it attempts to define the

---

[26] For just one example, see B Farmer, 'Brimstone: British Missile Envied by the US for War on Isil', The Telegraph, 1 October 2014, http://www.telegraph.co.uk/news/uknews/defence/11133680/Brimstone-British-missile-envied-by-the-US-for-war-on-Isil.html; 'Brimstone,' Royal Air Force, <http://www.raf.mod.uk/equipment/Brimstone.cfm>.

[27] This trend will only increase. In the words of a recent U.S. Army Public Request for Information on unmanned Systems and autonomy: '[w]ith the continued employment of increasingly sophisticated forces of unmanned systems, there will be an ever-increasing demand for new, efficient, innovative and effective technologies.' 'Request of Information (RFI), - Unmanned Ground System Technologies,' Solicitation Number W15QKN-15-X-6644, Department of the Army, 12 November 2014, <http://www.fbo.gov/index?s=opportunity&mode=form&tab=core&id=27b1076773e46c0980eed74168730906>

[28] See for example, B Docherty, 'Losing Humanity: The Case Against Killer Robots,' Human Rights Watch & International Human Rights Clinic (Harvard Law School, November 2012), 1; P Singer, *Wired for War: The Robotics Revolution and Conflict in the 21st Century* (New York: The Penguin Press, 2009); B Boothby, 'How Far Will the Law Allow Unmanned Targeting to Go?' in D Saxon (ed.), International Humanitarian Law and the Changing Technology of War, pp. 45 - 63. A brief but helpful summary of the debate is J Thurnher, 'The Law That Applies to Autonomous Weapon Systems,' 17 *ASIL Insights*, 4 (18 January 2013), <http://www.asil.org/insights130118.cfm>.

[29] M Schmitt, 'Autonomous Weapons Systems and International Humanitarian Law: A Reply to the Critics,' Draft Current as of 2 December 2012, United States Naval War College, 24.

[30] The President of the International Committee of the Red Cross describes autonomous weapon systems and cyber weapons as 'new territories' requiring engagement with states to determine how these weapons might be used. P Mauer, remarks at Leiden University College The Hague, 22 May 2014.

[31] I Kant, 'The Contest of Faculties,' in Hans Reis (ed.), *Kant's Political Writings* (Cambridge, Massachusetts: Harvard University Press, 1970), p. 177, emphasis in original. Although the word 'history' most often refers to

international legal contours (i.e. the lex lata) of the design and employment of new generations of autonomous weapon technologies.[32] All law is based on the allocation of responsibility.[33] Thus, as part of a review of the implicit challenges for the application of treaty and customary law to these new weapons, I examine whether humans should retain their responsibility to think and reason about complex (and sometimes contradictory) value-based decisions.

III. The Current Debate

A. International Law and Autonomous Weapon Systems

Technology plays a crucial role in the development of international law.[34] As weapons technology advanced over time, so has international law evolved to restrain its characteristics and use.[35] For example, during armed conflict, it is prohibited under

---

an account of past events, the term can also mean encompass 'acts, ideas or events that will or can shape the course of the future; immediate but significant happenings.' 'History,' Dictionary.com, <http://dictionary.reference.com/browse/history>. As Professor (now Judge) Crawford observed: 'history happens forwards. History happens day-by-day.' *Maritime Dispute (Peru v. Chile*) (Verbatim Record) [14 December 2012] ICJ [12] <http://www.icj-cij.org/docket/files/137/17230.pdf>. With respect to new weapon technologies, one commentator observes that 'we are at a point in history where we can see into the future of armed conflict and discern some obvious points where future technologies and developments are going to stress the current law of armed conflict.' E Talbot Jensen, 'The Future of the Law of Armed Conflict: Ostriches, Butterflies, and Nanobots,' 35 *Michigan Journal of International Law* 2 (2014), 253, 256.

[32] Study and analysis of challenges in international law with respect to changing weapon technologies are common. For reflections on the current and future law of autonomous weapon systems, see N Bhuta et. al. (eds.), *Autonomous Weapon Systems – Law, Ethics, Policy* (Cambridge University Press, 2016) and the '2015 Meeting of Experts on Lethal Autonomous Weapons Systems,' Convention on Certain Conventional Weapons, 13 – 17 April 2015, <http://www.unog.ch/80256EE600585943/(httpPages)/6CE049BE22EC75A2C1257C8D00513E26?OpenDocument>. In the context of cyber operations, see M Schmitt, 'Rewired Warfare: Rethinking the Law of Cyber Attack,' *International Review of the Red Cross* (2014) and P Margulies, 'Sovereignty and Cyber Attacks: Technology's Challenge to the Law of State Responsibility,' 14 *Melbourne Journal of International Law* (2013), 496.

[33] C Droege, 'Get Off My Cloud: Cyber Warfare, International Humanitarian Law, and the Protection of Civilians,' 94 *International Review of the Red Cross*, 886 (Summer 2012), 533, 541.

[34] C Picker, 'A View from 40,000 Feet: International Law and the Invisible Hand of Technology,' 23 *Cardozo Law Review* (2001), 149, 157.

[35] See inter alia, the 'St. Petersburg Declaration Renouncing the Use, in Time of War, of Explosive Projectiles Under 400 Grammes Weight,' 29 November/11 December 1868, <http://www.icrc.org/ihl/INTRO/130?OpenDocument> and Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects, Protocol on Blinding Laser Weapons, Protocol IV (13 October 1995),

international humanitarian law to use weapons, projectiles and material and methods of warfare of a nature to cause superfluous injury or unnecessary suffering.[36] Indiscriminate attacks, including 'those which employ a method or means of combat which cannot be directed at a specific military objective,' are unlawful.[37]

Today much of the debate about autonomous weapon systems focuses on the question whether it is lawful (and moral) to develop and deploy autonomous weapon systems that will exercise lethal force without human involvement or oversight.[38] Human Rights Watch and the International Human Rights Clinic ('IHRC') at Harvard Law School have argued strenuously that lethal autonomous weapon systems should be banned because they will be unable to fulfil the requirements of international humanitarian law[39] and international human rights law,[40] and, when they fail to do so, will create a lacuna in the ability to hold individuals accountable for violations of international law.[41]

In response to Human Rights Watch and the IHRC, Michael Schmitt and Jeffrey Thurnher argue that a ban of autonomous weapon systems 'is unsupportable as a matter of

---

<http://www.unog.ch/80256EDD006B8954/(httpAssets)/8463F2782F711A13C12571DE005BCF1A/$file/PROTOCOL+IV.pdf>.

[36] Art. 35, Additional Protocol I, 1977 to Geneva Protocol I Additional to the Geneva Conventions of 12 August 1949, and Relating to the Protection of Victims of International Armed Conflicts, (hereinafter 'API'). This rule also constitutes an obligation under customary international humanitarian law. Rule 70, 'Weapons of a Nature to Cause Superfluous Injury or Unnecessary Suffering', ICRC Customary International Humanitarian Law Study, <htpp://www.icrc.org/customary-ihl/eng/docs/v1_cha_chapter20_rule70>.

[37] Art. 51 (4), API. This rule also constitutes an obligation under customary international humanitarian law. Rule 71, 'Weapons That Are by Nature Indiscriminate,' ICRC Customary International Humanitarian Law Study, <http://www.icrc.org/customary-ihl/eng/docs/v1_rul_rule71>. The phrase 'means of combat' generally refers to the weapons used while 'methods of combat' generally refers to the way in which weapons are used. ICRC Commentary to art. 51, API, para. 1957, <http://www.icrc.org/applic/ihl/ihl.nsf/INTRO/470>.

[38] M Wagner, 'Autonomy in the Battlespace: Independently Operating Weapon Systems and the Law of Armed Conflict,' in D Saxon (ed.), International Humanitarian Law and the Changing Technology of War, pp. 99 – 122; K Anderson & M Waxman, 'Law and Ethics for Autonomous Weapon Systems: Why a Ban Won't Work and How the Laws of War Can,' *American University Washington College of Law Research Paper* No. 2013-11 (Jean Perkins Taskforce on National Security and Law).

[39] Docherty, 'Losing Humanity,' pp. 5, 30 – 36 and 46 - 48. Human Rights Watch is part of an international consortium of organizations dedicated to achieving a ban on 'killer robots.' See Campaign to Stop Killer Robots, <http://www.stopkillerrobots.org/>.

[40] B Docherty 'Shaking the Foundations: The Human Rights Implications of Killer Robots,' *Human Rights Watch and International Human Rights Clinic* (Harvard Law School, May 2014), 25.

[41] B Docherty, 'Mind the Gap: The Lack of Accountability for Killer Robots,' *Human Rights Watch & International Human Rights Clinic* (April 2015), 25 and 37.

law, policy and operational good sense.'[42] Schmitt and Thurnher contend that nothing in international humanitarian law *per se* supports a ban on autonomous weapons and, indeed, a ban on these weapons would deprive militaries of a valuable tool for *compliance* with the law.[43] Similarly, William Boothby concludes that, depending on the capacity of the technology, the employment of autonomous weapon systems will be lawful, at least in certain situations.[44]

Past and present officials of the International Committee of the Red Cross ('ICRC') acknowledge possible advantages in the development and use of autonomous weapon systems. When he was President of the ICRC, Jacob Kellenberger observed, cautiously, that a 'robot could be programmed to behave more ethically and far more cautiously on the battlefield than a human being.'[45] Similarly, Professor Sassóli, no stranger to situations of armed conflict, notes that 'weapon systems which do not base the use of force upon an ad hoc human decision offer the advantage of a greater possibility of respecting international humanitarian law.'[46]

B. Human Dignity and Autonomous Weapon Systems

Lawyers and philosophers make a legal/moral argument that human dignity is violated when an autonomous weapon (i.e. a machine) takes a human life. Peter Asaro, for example,

---

[42] M Schmitt & J Thurnher, 'Out of the Loop: Autonomous Weapon Systems and the Law of Armed Conflict,' 4 *Harvard National Security Journal* (2013), 231, 233.
[43] *Ibid*, pp. 243 – 265.
[44] B Boothby, 'How Far Will the Law Allow Unmanned Targeting to Go?' in Saxon, International Humanitarian Law and the Changing Technology of War, pp. 57–59 and 62.
[45] 'Keynote Address,' International Humanitarian Law and New Weapon Technologies, 34th Round Table on Current Issues of International Humanitarian Law, San Remo, 8 September 2011, <http://www.icrc.org/eng/resources/documents/statement/new-weapon-technologies-statement-2011-09-08.htm>. 'Only humans can be inhuman and only human beings can deliberately choose not to comply with the rules they were instructed to follow.' M Sassóli, 'Autonomous Weapons and International Humanitarian Law: Advantages, Open Technical Questions and Legal Issues to Be Clarified,' 90 *International Law Studies* (2014), 308, 310.
[46] *Ibid*, 311. This argument presupposes that it is possible to build autonomous weapon systems that are as accurate as the average soldier vis a vis the targeting rules of international humanitarian law. *Ibid.*

explores the moral question 'whether computer, machine or automated process ought to make these decisions of life and death at all.'[47] He contends that it is immoral to kill without the involvement of human reason, judgment and compassion.[48] To enjoy dignity, persons must receive respect and respect (Asaro claims) includes a reason or reasons when the rights of persons are violated. Since autonomous weapons will kill in response to mathematical algorithms rather than reason(s), Asaro argues that when we permit a machine to make decisions about the taking of human life, we violate that person's dignity.[49]

Similarly, Christoph Heyns, the United Nations Special Rapporteur for Extrajudicial and Summary executions, contends that the 'flipside of living a dignified life is dying a dignified death.' For Heyns, death with dignity, whether in an armed conflict or law enforcement situation, requires some degree of human thought in the determination of whether to exercise lethal force: 'Machines cannot fathom the importance of life, and the significance of the threshold that is crossed when a life is taken.'[50]

In chapter four of my dissertation, I argue that the conclusion of Professors Asaro and Heyns that the use of autonomous weapon systems to take human life constitutes a violation of human dignity is correct. However, the rationale that they provide in support of their conclusion – that we should focus our concerns on the dignity of the victim of the use of lethal force – is flawed. Instead, it is important to observe that as the technology advances, autonomous weapon systems will engage in hostilities and law enforcement activities at

[47] P Asaro, 'On Banning Autonomous Weapon Systems: Human Rights, Automation and the Dehumanization of Lethal Decision-Making,' 94 *International Review of the Red Cross*, 886 (Summer 2012), 687, 699.
[48] *Ibid*, 708.
[49] P Asaro, 'Human Dignity and Autonomous Weapon Systems,' Presentation to Conference on *Autonomous Weapon Systems – Law, Ethics, Policy*, European University Institute, Academy of European Law, 24 April 2014.
[50] C Heyns, Presentation to Convention on Certain Conventional Weapons Meeting of Experts on *Lethal Autonomous Weapon Systems*, 16 April 2015, p. 6, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/1869331AFF45728BC1257E2D0050EFE0/$file/2015_LAWS_MX_Heyns_Transcript.pdf>. Heyns also argues that if the decision to take human life is removed from the responsibility of military officers, their dignity as well is violated. *Ibid*.

speeds measurable in miliseconds. As the velocity of autonomous machine actions and reactions increases, the role of artificial intelligence will expand as the space for human thought declines. Humans – even those ostensibly 'in-the-loop' or 'on-the-loop' - will be unable to discern the development of bad 'decisions' by autonomous machines and, crucially, to intervene to change those decisions.[51] This dynamic will obstruct the development of sound human judgment that arises from opportunities for human reflection on one's own experience and that of others. Such an evolutionary retreat is an implicit rejection of the value and autonomy of the *living* human person, which constitutes a violation of human dignity.[52]

C. The Function of Law and Autonomous Weapon Systems

In addition to discussions of specific international legal rules, a more foundational review of the function and application of law and their relevance to autonomous weapon systems is necessary. The fact that the use of weapons occurs within frameworks of legal norms[53] reflects the importance of law in society.[54] Descriptions of the function of law are myriad and often emphasise the use of law to maintain order in society.[55] This dissertation,

---

[51] Michael Schmitt and Jeffrey Thurnher suggest that '[f]uture combat may … occur at such a high tempo that human operators will simply be unable to keep up. Indeed, advanced weapon systems may well "create an environment too complex for humans to direct."' 'Out of the Loop: Autonomous Weapon Systems and the Law of Armed Conflict', 238. (citing P Singer, *Wired for War*: The Robotics Revolution and Conflict in the 21st Century, New York, The Penguin Press, 2009, p. 128; quoting Thomas Adams, Colonel (Ret), U.S. Army).

[52] Renaissance writers commonly understood man's unique ability to understand ideas and to act upon his judgment as his 'real dignity.' H Baker, *The Image of Man: A Study of the Idea of Human Dignity in Classical Antiquity, the Middle Ages, and the Renaissance* (New York: Harper and Row, 1961), p. 299. Pico della Mirandola, for example, warned that humans should never 'through slothful inaction to lose our power of reason, that faculty by which the mind examines, judges and measures all things.' G. Pico della Mirandola, *Oration on the Dignity of Man* (1486), <http://en.wikipedia.org/wiki/Oration_on_the_Dignity_of_Man>.

[53] A 'norm' is the meaning of an act by which certain behavior is sanctioned, commanded, permitted, or authorized. H Kelsen, *Pure Theory of Law*, Max Knight (trans.) (Berkeley: University of California, 1978), pp. 5-6.

[54] For a discussion of how law, including international law, comprehends and regulates human behavior, see Kelsen, pp. 31, 33, 71, 320 and 325.

[55] See L Fuller, *The Morality of Law* (New Haven: Yale University Press, 1964), p. 106 (the function of law is 'to subject human conduct to the governance of rules.'); J Finnis, *Natural Law and Natural Rights* (Oxford, Clarendon Press, 1980), p. 268 ('…law brings definition, specificity, clarity and thus predictability into human

however, adopts a more flexible approach expressed by a jurist during the last century: '… it is the objective of law to carry out the *adjustment of rights* between [persons] and between [individual] and sovereign according to the ideological purposes of the state.'[56] This broader view permits a more inclusive analysis of the use of autonomous weapon systems by multiple societies and cultures with different expectations and understandings of law. Consistent with this definition, the function of law must also include the adjustment of rights between states when disputes arise between them.

Humans 'deliberate' (Aristotle's term for the process of thinking and reasoning) about matters that are in their power.[57] Autonomous technology, however, forces persons to relinquish this power of deliberation and decision to a machine.[58] If law's purpose is to facilitate the adjustment of rights between human beings, then we must understand how the employment of lethal autonomous weapons will impact human ability to make these adjustments. Will the benefits of delegating important responsibilities – such as reasoning and determinations about the use of lethal force - to autonomous machines outweigh the price of forfeited human ability to apply law and adjust the rights protected by law? This examination of the relationship between the function of law and autonomous weapon systems is absent in the literature.[59]

---

interactions, ….'); R MacIver, *The Modern State* (Oxford: The Clarendon Press, 1926), pp. 289 – 290 ('Order is the foundation on which life builds, and order is precarious and hollow until international law is assured').

[56] C Clark, 'The Function of Law in a Democratic Society,' 9 *University of Chicago Law Review* (1942), 393, 400 (emphasis added). Clark explains that in democratic societies, law can be used to avoid the kinds of odious restraints and inhibitions found in autocracies. *Ibid*. Importantly, international law envisages the protection of individual interests, or natural rights, and not only rights resulting from a positive legal order. *Barcelona Traction, Light and Power Company* (Separate Opinion of Judge Morelli) Limited Judgment ICJ Rep. Part III [1970] para. 2.

[57] Aristotle believed that humans deliberate about ends rather than means. We determine a desired objective or outcome and then consider how and by what means it should be attained. Aristotle, *Nichomachean Ethics*, W D Ross (trans.), Book III, p. 5. '[E]xcellence in deliberation involves reasoning.' *Ibid*, Book VI, p. 7.

[58] Author interview with Gianfranco Visentin (Head), Automation and Robotics Section, European Space Research and Technology Centre, European Space Agency, Noordwijk, The Netherlands, 4 November 2013.

[59] On 15 April 2015, the organization Article 36 made a brief reference to this issue in its remarks to the Meeting of Experts on *Lethal Autonomous Weapon Systems*, sponsored by the Convention on Certain Conventional

D. A Misplaced Assumption in the Literature

One common assumption in the legal and philosophical literature is that the important questions about lawfulness and morality of autonomous weapon systems can be resolved by agreement on semantic standards about their design and use. These standards are usually expressed as 'appropriate levels of human judgment' or 'meaningful human control' over the use of force by autonomous weapons.[60]

For several reasons, the application of phrases such as 'appropriate levels of human judgment' and 'meaningful human control' to autonomous weapon systems is problematic. First, obviously these constructions are open to multiple interpretations.[61] For example, in its statement to the 2015 Meeting of Experts on Lethal Autonomous Weapons sponsored by the state parties to the Convention on Conventional Weapons, the Government of Israel observed that:

> 'delegations have made use of various phrases referring to the appropriate degree of human involvement in respect to lethal autonomous weapon systems. Several states mentioned the phrase "meaningful human control.'' Several other states did not express support for this phrase. Some of them thought that it was too vague, and the alternative phrasing "appropriate levels of human judgment" was suggested. We have

---

Weapons: '[m]achines do not make "legal judgments" and "apply legal rules."' <http://www.unog.ch/80256EDD006B8954/(httpAssets)/330B1C078D81748CC1257E290046E3E7/$file/2015_LAWS_MX_Article+36_IHL.pdf>.

[60] Professor Beard uses the phrase 'effective exercise of human judgment.' J Beard, 'Autonomous Weapons and Human Responsibility,' 45 *Georgetown Journal of International Law* (2014), 617, 621.

[61] Jason Millar, an engineer and ethicist, observes that the active involvement of human beings in the direction of autonomous systems will not necessarily equate to 'meaningful human control.' Presentation to Convention on Certain Conventional Weapons Meeting of Experts on *Lethal Autonomous Weapon Systems*, 15 April 2015, p. 5, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/F483D421E67D230FC1257E2F0033E690/$file/Jason+Millar+-+Meaningful+Human+Control+and+Dual-Use+Technology.pdf>. Furthermore, the Government of Poland recently suggested that the undefined concept of 'meaningful human control' should be extended to include 'meaningful state control', i.e. evaluating 'meaningful human control' 'from the standpoint of state's affairs, goals and consequences of its actions.' Presentation of Poland to Convention on Certain Conventional Weapons Meeting of Experts on *Lethal Autonomous Weapon Systems*, 14 April 2015, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/16BDFE48306133F6C1257E31002BA329/$file/2015_LAWS_MX_Poland_characteristics.pdf>. Nevertheless, highly-specific restrictions also can be problematic because technology can be developed and/or re-designed to avoid the prohibited specifications. P. Appelqvist, 'Systems Approach to LAWs: Characteristics, Considerations and Implications,' Presentation to Convention on Certain Conventional Weapons Meeting of Experts on *Lethal Autonomous Weapon Systems*, 14 April 2015, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/059B98F445271A6BC1257E280041B71C/$file/CCW_LAWS_Appelqvist.pdf>.

also noted, that even those who did choose to use the phrase "meaningful human control," had different understandings of its meaning.'[62]

Disagreements about the 'meaning' of 'meaningful human control' are not difficult to surmise. Does the word 'meaningful' refer to the human who exerts the control? Or does 'meaningful' refer to the result of the actions of an autonomous weapon system or systems during a particular attack, operation, or military campaign? In the context of armed conflict, should the term 'meaningful' also subsume considerations of military necessity and/or military advantage?

Secondly, phrases such as 'appropriate levels of human judgment' and 'meaningful human control' are not legal standards and, indeed, have no basis in international law. A focus on these terminologies creates a confusing distraction from the more fundamental questions concerning the legalities of autonomous weapons.[63]

Third, an emphasis on semantics ignores several important dynamics that affect the use and/or abuse of autonomous weapon systems and which are not examined carefully in the legal and philosophical literature. For example, the technical aspects and capacities of these weapon systems naturally affect their relationship with human beings and with international law. Will the perception of 'meaningful human control' change if the technology varies? Do

[62]Government of Israel, 2015 Meeting of Experts on *Lethal Autonomous Weapons*, 15 April 2015, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/AB30BF0E02AA39EAC1257E29004769F3/$file/2015_LAWS_MX_Israel_characteristics.pdf>. Unhelpfully, the Government of Ireland endorsed a standard of "effective human control' over lethal autonomous weapon systems *and* the standard of 'meaningful human control.' Statement by Jacqueline O'Halloran Bernstein to Convention on Certain Conventional Weapons Meeting of Experts on *Lethal Autonomous Weapon Systems*, 15 April 2015, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/E2C0823A66B1036DC1257E2900475E27/$file/2015_LAWS_MX_Ireland_Characteristics.pdf>.

[63] W Boothby, 'Possible Challenges to International Humanitarian Law,' Presentation to Convention on Certain Conventional Weapons Expert Meeting on *Lethal Autonomous Weapons*, April 2015, pp. 3-4, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/616D2401231649FDC1257E290047354D/$file/2015_LAWS_MX_BoothbyS+Corr.pdf>; The U.K. Government has stated that 'international humanitarian law provides the appropriate paradigm for discussion.' Statement to Convention on Certain Conventional Weapons Informal Meeting of Experts on *Lethal Autonomous Weapons*, April 2015, p. 2, <http://www.unog.ch/80256EDD006B8954/(httpAssets)/1CBF996AF7AD10E2C1257E260060318A/$file/2015_LAWS_MX_United+Kingdom.pdf>.

cruder forms of autonomous technologies always require more control to be 'meaningful'? Or, if a highly sophisticated autonomous weapon system is available, will minimal or no human control suffice, as long as the overall result is 'meaningful'? To begin to address these questions, chapter two is a typology that describes the different kinds of autonomous weapon technology now in use and/or being developed for the future, and the implications of this technology for human control.

E. The Subject of Design

The subject of 'design' speaks to a third important omission in the literature about autonomous weapon systems. The semantical 'standards' about 'appropriate levels of human judgment' and ' meaningful human control' reveal little about the challenges faced by persons and/or machines in understanding their environment, and each other, particularly during armed conflict and law enforcement activities where the need for human judgment is constantly shifting.[64] A better approach would be to focus more of the debate on the design of autonomous weapon systems[65] and apply a vision of autonomy referred to as 'coactive design' or 'human-machine interdependence.'

In particular battlespace circumstances, success (and compliance with the law) depends on neither the 'superior' technology nor the most sophisticated equipment, but

[64] The form and substance of communications between humans and autonomous weapon systems may also evolve in ways that are difficult to foresee today. Robotic scientists have observed that, as interactions between humans and robots increase, the two entities begin to develop their own language. Professor Luc Steels, 'Ten Big Ideas of Artificial Intelligence,' *25th Benelux Conference on Artificial Intelligence*, Delft University of Technology, 8 November 2013.

[65] Christoph Heyns briefly mentions the issue of design in 'Autonomous Weapon Systems: Living a Dignified Life and Dying a Dignified Death,' in Bhuta et. al., Autonomous Weapon Systems – Law, Ethics, Policy, p. 14. Jason Millar observes that in order to design autonomous weapons to permit meaningful human control we must first 'understand the relationship between design features and human moral psychology….' Millar, Presentation to Convention on Certain Conventional Weapons Meeting of Experts on Lethal Autonomous Weapon Systems, p. 9.

instead the technology best suited to the resources and circumstances at hand.[66] The coactive design model attempts to leverage and integrate the different strengths of humans and machines in order to maximize (and legalize) the performance of weapons systems.[67] For example, it is true that computers can outperform humans in tasks such as the collection and filtering of information. However, 'for decisions that matter, human judgment is better and faster'[68] because humans have greater ability to recognise context[69] and apply inductive reasoning for creative thinking.[70]

Thus, under the coactive perspective of autonomy, it is shortsighted to suggest that human factors and input can be minimised and segregated in the design and fielding of machines.[71] Priority should be given to the reinforcement of human machine teamwork – 'collaborative' autonomy'[72] - rather than separation of duties between humans and machines.[73] Therefore, autonomy can be viewed, not as an end in itself, but as a tool to accomplish particular objectives.[74]

---

[66] A Roland, 'Technology and War: A Bibliographic Essay,' in Merritt Roe Smith (ed.), *Military Enterprise and Technological Change: Perspectives on the American Experience* (Cambridge Massachusetts: The MIT Press, 1985), p. 378.

[67] Author interview with Dr. Jeffrey Bradshaw, Senior Research Scientist, Florida Institute for Human and Machine Cognition, Leiden, Netherlands, 10 June 2014.

[68] Author interview with Dr. Matthew Johnson, Researcher, Florida Institute for Human and Machine Cognition, Leiden, Netherlands, 10 June 2014.

[69] Author interview with Dr. Jeffrey Bradshaw,

[70] Cummings, 'Man Versus Machine or Man + Machine?' pp. 12. Research efforts are underway to mimic human reasoning and judgment processes in machines. One example is KEEL Technology. 'KEEL stands for Knowledge Enhanced Electronic Logic,' electronic mail message from Tom Keeley, 2 and 13 June 2014. See 'Keel Technology for Complex Problems', <http://www.compsim.com/>.

[71] J Bradshaw, et. al., 'The Seven Deadly Myths of "Autonomous Systems,"' *Human - Centred Computing* (May/June 2013), pp. 57, <http://www.jeffreymbradshaw.net/publications/IS-28-03-HCC_1.pdf>.

[72] A Clare et. al., 'Assessing Operator Strategies for Real-time Replanning of Multiple Unmanned Vehicles,' 6 *Intelligent Decision Technologies* (2012), 221, 222.

[73] *Ibid*, pp. 58 – 60. As a team, humans and computers are far more powerful than either alone, especially under uncertainty. M Cummings, 'Man Versus Machine or Man + Machine?' 12. For example, if autonomous weapon systems can exercise 'self-recognition', i.e. the capacity to detect that it is operating outside the conditions for which it was designed, the machine will call on humans for increased supervision. Author interview with Dr. Matthew Johnson.

[74] Author interview with Gianfranco Visentin, Head, Automation and Robotics Section, European Space Research and Technology Centre, European Space Agency, Noordwijk, The Netherlands, 4 November 2013.

IV. The Structure of the Dissertation

As Professor Benvenisti perceives, much of the ongoing legal and moral debate on autonomous weapon systems essentially is a manifestation of a 'circular argument between technological optimists and pessimists ….'[75] Inevitably, the 'circular argument' will produce an unsatisfactory result because, as mentioned above, the most important question for lethal autonomous systems is *not* simply whether a human or machine should decide to kill. The crucial question is whether there are certain responsibilities of human reasoning that we should not delegate to machines. To answer this question in a manner that will ground the optimists and satisfy the pessimists, this dissertation addresses the relationship between autonomous weapon systems, their design, human dignity and international law.

To facilitate the discussion, chapter two, 'Typology of Autonomous Weapon Systems,' describes basic concepts and elements of autonomous weapon systems as well as technical characteristics and capacities of specific systems. I describe how states are developing weapon systems with faster and more autonomous functions, including the capacity to identify targets and destroy them with lethal force. I argue that efforts to fit these systems into fixed categories such as 'in-the-loop,' 'on-the-loop,' 'semi-autonomous,' 'fully autonomous,' etc., fail to encompass the complexities of the systems and the fluid realities of modern armed conflict. Furthermore, as the speed of autonomous weapon systems increases, particularly with the advent and use of 'swarm' technology, semantic standards such as 'meaningful human control' become unrealistic and irrelevant. Instead, states that develop autonomous weapon systems should prioritise a design that ensures human-machine interdependence and teamwork so that human reasoning and judgment is not discarded at critical phases of warfighting, including decisions to use force.

[75] E Lieblich & E Benvenisti, 'The Obligation to Exercise Discretion: Why Autonomous Weapon Systems Are Illegal,' in Bhuta et. al., Autonomous Weapon Systems – Law, Ethics, Policy, p. 246.

In chapter three, 'The Sources of International Law and the "Place" of Human Dignity,' I discuss the three primary sources of international law as well as the concept of *jus cogens* (I refer to subsidiary sources such as judicial decisions and the writings of prominent commentators throughout this dissertation). I argue that human dignity is a treaty-based legal starting point, a guiding concept that states must use to operationalise the norms and values that underlie their existence as independent societies.

In chapter four, 'Autonomous Weapon Systems and Human Dignity,' I address the claim by some opponents of autonomous weapon systems that that the autonomous exercise of lethal force damages one of the conceptual pillars of international law: human dignity. I argue that the use of autonomous machines for warfighting per se does not undermine human dignity. However, I suggest that there are fundamental areas of life where humans – to preserve their value and autonomy as persons and hence their dignity – must retain their responsibility to think and express reason. The inevitable velocity of autonomous military engagements will obstruct the development of sound human judgment that arises from opportunities for reflection on questions and decisions involving complex values. This dynamic, I contend, *will* violate human dignity, as the ability of humans to fully develop their personalities – including the capacity to respect the rights of others - will inevitably diminish.

In chapter five, 'Autonomous Weapon Systems and International Humanitarian Law,' I identify the values-based decisions concerning the exercise of lethal force in international humanitarian law that demand the inclusion and direction of human reasoning. I argue that 1) humans should make decisions in situations where a balance must be struck between the most fundamental values of international humanitarian law: military necessity and humanity, 2) human involvement is not necessary in military decisions that require more automatic and instinctive behaviour, such as close-quarters combat, or during processes of information

gathering and fusion, and 3) the fundamental duty to protect human dignity limits armed forces and organized armed groups to the of use autonomous weapon systems with a co-active design that permits collaborative autonomy for complex, values-based decisions.

In chapter six, 'Autonomous Weapon Systems and International Human Rights Law,' I explain that international human rights law is most relevant to the use of autonomous weapon systems in two sets of circumstances: 1) in law enforcement/anti-terrorist situations where state authorities use lethal force, and 2) during armed conflict, where international human rights law applies concurrently with international human rights law. I demonstrate that, paradoxically, the deployment of lethal autonomous weapon systems by states outside of armed conflict potentially can reduce the frequency of the exercise of deadly force by state agents. However, the widespread use of lethal autonomous weapons carries a serious cost to human dignity, as the delegation to machines of the decision(s) to apply lethal force, as well as determinations about whether arrest or capture is more appropriate, restricts the rights to freedom of thought and expression. Thus, I argue that the burden on the enjoyment of these rights produced when autonomous weapon systems make these value-based decisions outweighs possible benefits to the protection of the right to life.

Chapter seven, 'Autonomous Weapon Systems and International Criminal Law,' describes how the employment of lethal autonomous weapon systems by militaries and security forces will influence efforts to hold individuals responsible for violations of the laws of war and gross violations of international human rights law, such as crimes against humanity. I address the question whether impunity for crimes committed with lethal autonomous weapon systems will be so onerous that it threatens the dignity of individuals, and consequently the integrity of our legal system(s). I argue that the use of co-active designs for lethal autonomous weapon systems permits teamwork between humans and autonomous

technologies that can result in lower levels of criminality and higher levels of accountability when crimes occur. This strategy serves to preserve the human dignity of all members of society, including participants in armed conflict and law enforcement operations.

Finally, in chapter eight, 'Autonomous Weapon Systems and the Responsibility of States and Arms Manufacturers,' I describe the responsibilities of states and arms manufacturers vis a vis the design, development and employment of autonomous weapon systems. I evaluate different theories available to states and to the international community to enforce secondary rules applicable to autonomous weapons. I argue that under existing law, states already bear an international legal responsibility to ensure that autonomous weapon systems permit human-machine interdependence in circumstances that call for assessment and weighing of complex values.

I conclude that international law, to preserve its capacity to adjust rights and responsibilities between states, and between states and individuals, must ensure the pre-eminence of the principle of human dignity. Yet, the delegation of human responsibility for complex, value-based judgments to autonomous weapon systems erodes human dignity and international law. To preserve human dignity and thereby the law's relevance, autonomous weapons systems must bear a co-active design to ensure human involvement in the complex value judgments that are necessary during armed conflict and civil strife.