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New technology, same old strategy: Why artificial **super***intelligence represents the logical continuation of the US quest for war virtuousness*

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PART I

Any sufficiently advanced technology is indistinguishable from magic.

—Arthur C. Clarke, Science fiction writer

Self-awareness and consciousness

At the beginning of February 2012, *Wired* posted a short article that got a lot of people talking within the drone community[1].[2] It was not so much the article itself that proved particularly interesting; rather, what dazzled everyone was the video it

[1] Here, I use the term drone community primarily to denote the academics conducting research on military drones. However, this community also encompasses individuals who may or may not be scholars and who consider drones as recreational objects. Such individuals, which I label as hobbyists, would have an interest in the *Wired* article, for, like the famous launches made by former Apple chief executive officer Steve Jobs, it introduced a new technology that would eventually be made available to the general public.

[2] Jason Paur, "Autonomous Quadrotors Fly Amazing Formations," Wired, last modified February 3, 2012, http://www.wired.com/2012/02/autonomous-quadrotors-fly-amazing-formations/.

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featured. The less than two minutes long video showcased twenty quadcopter drones engineered by roboticists at the University of Pennsylvania. The impressive element of this footage was that the remotely piloted drones were flown in intricate arrangements with a matchless degree of synchronization without entering in collision with one another.[3] Of course, this achievement does not constitute a manifestation of ASI, although the software programming involved in the conception of these drones points to the presence of some degree of human genius among these Ivy Leaguers. So why does this matter for the present discussion on artificial intelligence (AI)?

It is significant because while this accomplishment may not be a sign of ASI, it demonstrates a capacity to simulate "intelligent" behavior with a high level of verisimilitude. This is because, just like birds flying together in swarm or fish swimming in a shoal, each quadcopter was to some degree "sensitive" to the presence of the other quadcopters next to it, which prevented impacts between two or more of them and/or the obstacles in their environment. Whether these drones were *aware* or *conscious*—that is, in the human sense of the word where I am aware that I am writing these lines as I write these lines—of their surrounding is a totally different question to which the answer is likely a "no." But let us consider the following extract from *Transcendence*.[4]

In one of the scenes of *Transcendence*, the character of Joseph Tagger, portrayed by Morgan Freeman, asks a quantum computer whether it can prove that it is self-aware. The computer surprised Tagger by returning the question: "Can you prove that you are?"[5] Evincing self-awareness is indeed a difficult task, perhaps even unattainable. René Descartes' catchphrase "Cogito ergo sum"—Latin for "I am thinking, therefore I exist"—is probably the simplest way to substantiate our self-awareness.[6] At the same time, it is revealing of how few tools we have at our disposal to prove self-awareness. A logical objection to this mantra, which Descartes acknowledges, is that "you cannot

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[3] Ibid.

[4] *Transcendence*, DVD (2014; Burbank, CA: Warner Bros).

[5] For a short clip of this scene see: https://www.youtube.com/watch?v=Dtndxiz66p4 (Accessed August 31, 2014).

[6] René Descartes, *Meditations on First Philosophy: With Selections from the Objections and Replies* (Cambridge, UK: Cambridge University Press, 1996), p. 68.

know whether you exist or even whether you are thinking"[7] as this requires a prior grasp of what it means to exist or to think. Yet, the French philosopher argues that there exists an instinctive sense in individuals, which is sufficient for them to become self-aware of their existence through thinking. He maintains that this "internal awareness […] always precedes reflective knowledge"[8] therefore (or somehow) allowing us to bypass the circular problem of not possessing anterior knowledge about the meaning of existence or thinking. This circumvention nonetheless involves the use of a reflective thought process as it merely substitutes for the lack of prior knowledge. Thus, the reasoning behind "Cogito ergo sum" is inherently reflective. That is, the thought processes that take place here are done consciously by the individual who is thinking. The people who become self-aware through this logic must actively think about it before they can get any sense of self-cognizance. This necessity renders the process a conscious one.

George Lakoff disagrees with how Enlightenment thinkers such as Descartes describe the way the human mind functions.[9] Dismissing the all too rational approach of the intellectuals of this period, Lakoff contends that the human mind operates in a much more unconscious fashion. In fact, he argues that since around 98 percent of the mind's activities take place subconsciously, the majority of our thinking is "*reflexive*—automatic, uncontrolled [original emphasis]."[10] This analysis is in direct contrast with that of Descartes who intimated that thinking was done mindfully. If Lakoff is right, we may, for all we know, still be deep inside Plato's cave,[11] facing a world we self-deceptively believe in when it may in fact be nothing more than a reflection of our shadows on a wall—a crude, yet powerful illusion that is exhibited without our knowledge of it. For Lakoff, thinking is done primarily reflexively, but also lightly reflectively while Descartes would argue that it is a purely reflective operation. It is important to note that Descartes' view of thought — that allows reaching self-

[7] Ibid., p. 69.
[8] Ibid.
[9] George Lakoff, *The Political Mind: A Cognitive Scientist's Guide to Your Brain and Its Politics* (New York, NY: Penguin Books, 2009), p. 271.
[10] Ibid., p. 9
[11] Plato, "Plato's Republic," trans. Benjamin Jowett, The Project Gutenberg, accessed August 31, 2014, http://www.gutenberg.org/cache/epub/150/pg150.html.

awareness—entails an impossibility of determining whether someone else is self-aware. This is because self-awareness is made possible through an "internal awareness"[12] and, therefore, while I may possess this internal capacity to be aware, I cannot use it to find out if you are aware or vice versa. Russell and Norvig corroborate this argument, specifying, "in ordinary life we never have *any* [original emphasis] direct evidence about the internal mental states of other humans."[13] Alan M. Turing also acknowledges the impossibility to determine someone else's feelings with any exactitude.[14]

Ok, but why all that fuss about self-awareness? Because the many definitions[15] of AI that Russell and Norvig discuss encompass notions such as reasoning, thinking, decision-making, and behaving,[16] which are processes that while not requiring self-awareness to take place can be sophisticated with it, hence opening the door to an evolving form of AI, namely artificial general intelligence (AGI) and perhaps ultimately ASI.[17] Peter Singer notes that the acquisition of (metaphorical) knowledge by an AI allows for its progress.[18] Furthermore, Harvard University psychologist Daniel Goleman highlights that "[s]elf-awareness is fundamental to psychological insight."[19] That is, I can more easily exercise my thinking and reasoning if I am aware that I am a thinking being than if I am unaware of it. Goleman argues that the same applies to emotions, which can be better controlled once we are aware of them.[20] Put differently,

[12] Descartes, *Meditations*, p. 69.

[13] Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (Montreal, QC: Prentice Hall, 2010), p. 1026.

[14] Alan M. Turing, "Chess," in *The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial Intelligence, and Artificial Life*, ed. B. Jack Copeland (Toronto, ON: Oxford University Press, 1953), p. 569.

[15] Russell and Norvig, *Artificial Intelligence*, p. 2.

[16] Actions such as reasoning, thinking, making decisions, and behaving are usually done by human beings. Thus, when they are used to describe the actions of AIs, AGIs, and ASIs they are used in a metaphorical sense. In other words, an AI does not literally reason or think; rather, it does something that is comparable to these human actions.

[17] AGI is essentially the level of intelligence equal to the human intelligence, but it is not that of a human (see Barrat (2013), p. 8). AI, then, is the level of intelligence right below AGI. ASI is the highest stage of intelligence.

[18] Peter W. Singer, *Wired for War: The Robotics Revolution and Conflict in the Twenty-first Century* (New York, NY: The Penguin Press, 2009d), p. 77.

[19] Daniel Goleman, *Emotional Intelligence: Why it can matter more than IQ* (New York, NY: Bantam Book, 1995), p. 54.

[20] Ibid., p. 55.

self-awareness and thinking/reasoning/behaving are processes that are interlaced. According to Geoffrey Jefferson, strong AI or ASI is reached once the computer regarded as such is *conscious* of its abilities.[21] Jefferson gives the example of a computer who would be able not only to orchestrate music, but also be *aware* that it did.[22] Thus, consciousness (and self-awareness) is a key element to the understanding of ASI. It is also at the center of contentions on the issue of ASI.[23]

For instance, John R. Searle argues that because ASI is a program — similar to a computer's software — rather than a machine it will not be able to occasion thinking nor will it be able to give rise to consciousness.[24] He believes that only machines akin to brains could generate thinking. Searle further argues that consciousness is an inherently biological event, which arises from neurobiological operations in the brain and therefore ought to be studied within the field of neurobiology.[25] James Barrat explains Searle's skepticism regarding the possibility of a thinking or conscious ASI by adding that AGI or ASI would only be able to duplicate the mechanical functions of the brain such as raw processing or computing power, but not the biological activities such as thinking, reasoning, or being conscious.[26] Searle defines the concept of consciousness as an amalgam of "inner, qualitative, subjective states and processes of sentience or awareness."[27] The subjective component is very important because it entails that being conscious may (and most probably does) vary from one individual to another. Hence, while you and I can both be conscious your consciousness may be different than mine as this subjectivity also involves different degrees or intensities of consciousness. The inner element in Searle's definition ties back to Descartes' "internal awareness," which leads to the impossibility of determining whether someone else possesses consciousness or is self-aware. But, as Barrat points out, when it comes to communicating with one

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[21] Russell and Norvig, *Artificial Intelligence*, pp. 1026.

[22] Russell and Norvig, *Artificial Intelligence*, p. 1026; Alan M. Turing, 1950. "Computing Machinery and Intelligence," in *The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial Intelligence, and Artificial Life*, ed. B. Jack Copeland. (Toronto, ON: Oxford University Press, 1950), p. 451.

[23] Russell and Norvig, *Artificial Intelligence*, p. 1033.

[24] John R. Searle, "Minds, brains, and programs," *The Behavioral and Brain Sciences* 3 (1980): p. 424.

[25] John R. Searle, "Consciousness," *Annual Review of Neuroscience* 231, 1 (2000): p. 557.

[26] James Barrat, *Our Final Invention: Artificial Intelligence and the End of the Human Era* (New York, NY: St. Martin's Press, 2013), p. 45.

[27] Searle, "Consciousness," p. 559.

other through language, we can hardly tell for certain whether we have been understood by our interlocutors aside from making a guess based on their reaction to what we articulated.[28] Yet, this uncertainty does not prevent us from using language successfully. I argue that the same can apply to consciousness. That is, I do not need an empirical confirmation that you are self-aware to continue interacting with you.

So far in this section, I discussed the ideas of self-awareness and consciousness, only moderately and not systematically addressing the core concept of ASI. I did so because it is essential to first look at the elements that are tied to the notion of intelligence, a notion that is itself present within AI, AGI, and ASI and therefore necessary to be dissected before dealing with them. Thus, this discussion merely served as a springboard to the task I now turn to, namely the exploration of intelligence.

(*Natural*) intelligence and autonomy

Animals such as birds and fish, while not human, are in a category apart from computers or robots and it would therefore be inappropriate to use the term AI when talking about their intelligence. Thus, if I may borrow the antonym of the word "artificial," I would characterize animals as possessing *natural*[29] intelligence. Of course, this intelligence is lesser than that of humans, but still involves the notions of self-awareness and consciousness. So are the birds that fly in swarm aware of the presence of other birds around them? They certainly enjoy a minimum of self-awareness, which allows them to dodge the other birds in their surroundings. And what about the fish that swim in shoal? Searle mentions that although some intentions are unconscious, intentionality is part of consciousness as a whole.[30] It is a component of consciousness that facilitates species survival so that when a predator such as a shark approaches a shoal, the fish know that it is time for them to leave. In other words, they are conscious of the danger posed by the shark and this consciousness has a direct impact on their behavior since they escape.

[28] Barrat, *Our Final Invention*, p. 46.
[29] This is not a technical term used in the literature on AI. I simply use the word "natural" to characterize a type of intelligence that is not man-made or artificial.
[30] Searle, "Consciousness," p. 564.

But what is it exactly that enables birds to avoid colliding with one another when they are in flight and that moves fish to run away when they see a predator? Intelligence. Put plainly, intelligence is a mechanism that gets them to make a decision on how to act or react when faced with a given situation, which they first had to assess.[31] Singer includes the notion of uncertainty to this definition. This uncertainty, however, is different than that discussed above in relation to the feelings or state of consciousness of someone else; rather, it pertains to the situation or environment faced by a subject. For intelligence to kick in or an intelligent behavior to be generated, the situation faced by the subject needs to be uncertain — at least *partially* unknown to the subject and therefore forcing it to think, reason, make a decision, and then (re)act/behave based on that decision. Turing argued that an element of randomness was necessary for an intelligent behavior to occur.[32] Let us take the example of a fish facing a shark. When trapping its prey, the predator will try to anticipate the former's reaction so as to conduct a successful attack. It is exactly where this randomness can prove useful as the fish—not knowing the precise intentions of its aggressor—faces an uncertain or unknown situation and the randomness within intelligence allows it to opt for a less (if not un)predictable behavior, which in this scenario may save its life.

Does intelligence require autonomy? What does autonomous decision-making mean? When I defended the proposal of my master's thesis, Kevin McMillan, one of my committee examiners, was quick to tell me about the importance of defining autonomy, which seems central to the idea of AI and its more advanced stages — AGI and ASI. When analyzing discourse, Paul Saurette and Kelly Gordon tell us that the more words are used to talk about a specific concept or argument, the more importance the author of the text accords to this concept or argument.[33] I was therefore quite surprised when I searched the word "autonomy" in the many books I borrowed on the topic of AI, for very few of them had the word listed in their indexes and those that did only featured the word on a page or two. This begs the question of whether autonomy is as crucial as one would think when talking about intelligence and decision-making. Given the place

[31] Singer, *Wired for War*, p. 75.

[32] Turing, "Computing Machinery," p. 463.

[33] Paul Saurette and Kelly Gordon, "Arguing Abortion: The New Anti-Abortion Discourse in Canada," *Canadian Journal of Political Science* 46, 1 (2013): p. 172.

ASI occupies in this paper, it is most certainly appropriate to tackle the issue, as ASI drones would inescapably encompass a high level of autonomy.

Russell and Norvig describe an autonomous being as one whose dependence on knowledge given it by its creators is absent.[34] They add that the entity possesses autonomy when it depends solely on its percepts to ensure its survival. Referring exclusively to *artificially* autonomous beings, Aaron M. Johnson and Sidney Axinn give us a more narrow definition of autonomy, maintaining that autonomous robots place reliance uniquely on their inner software.[35] For their part, Patrick Lin et al. define the autonomy of robots as the trait peculiar to robots that enables them to carry out activities within an environment without outside assistance after they have been actuated by an external force.[36] This last definition blends elements of Russell and Norvig *and* Johnson and Axinn's respective definitions since it explicitly allows the possibility of a reliance on former knowledge—which would fall under Johnson and Axinn's definition—yet does not prohibit the option of a being that would run on its percepts alone, hence falling under the definition of the other two scholars. Finally, Singer's understanding of autonomy relates to the "relative independence" a being has towards other beings, manifested in various degrees.[37] He gives the example of a plane's autonomy, which can range from non-autonomous to adaptive. The former level of autonomy refers to a plane that is entirely piloted and controlled by a human while the latter would require no human assistance and could even learn metaphorically from the situations it is faced with.[38] ASI would be characterized by adaptive autonomy.

The birds and fish from the scenarios discussed above would be considered autonomous regardless of which of the above four definitions is used. Of course, Johnson and Axinn *and* Lin et al.'s definitions refer to artificial and robotic beings, respectively and thus, animals would not fall under the scope of these definitions. Putting that technicality aside, however, we can see how animals would enjoy

[34] Russell and Norvig, *Artificial Intelligence*, p. 39.
[35] Aaron M. Johnson and Sidney Axinn, "The Morality of Autonomous Robots," *Journal of Military Ethics* 12, 2 (2013): p. 130.
[36] Patrick Lin, Keith Abney, and George Bekey, "Robot ethics: Mapping the issues for a mechanize world," *Artificial Intelligence* 175 (2011): p. 943.
[37] Singer, *Wired for War*, p. 74.
[38] Ibid.

autonomy according to these definitions too. Singer would characterize their autonomy as adaptive, for animals have the ability to learn although that capacity is not as developed as humans. Think about mammals such as monkeys and dolphins that have been able to learn from interactions with humans or birds such as parrots that can learn up to a few hundred words. Scientists at Duke University have even found learning capacities in reptiles, which can alter their behavior after having been repetitively exposed to certain external stimuli in their environment.[39] These animals possess adaptive autonomy but it is tied to their *natural* intelligence. In the following section, I look at the first stage of a non-natural intelligence, namely AI.

Artificial intelligence

The quadcopter drones designed by the University of Pennsylvania scholars are equipped with AI.[40] While they may not possess adaptive autonomy as their learning ability is fixed—that is, they cannot learn—Singer would maintain that they benefit from some level of autonomy and are therefore not fully human-dependent. When the drones are flown in figure eights or other elaborate arrangements, it is clear that they are partially if not completely relying on their internal software and at least somewhat independently of their human controllers to perform these labyrinthine maneuvers. This is because it would be impossible for a single human to control twenty drones at the same time. To be sure, Singer indicates that humans can hardly pilot or control two or more drones simultaneously, as this would considerably diminish their piloting accuracy and performance.[41] For this reason, when several drones or robots are being operated concurrently the human's role "in the loop" becomes supervisory, consequently granting drones higher degrees of autonomy as they increasingly rely on their internal software and exploit the abilities that are made possible by AI.

Were these quadcopters conscious of their existence or the presence of other drones in their immediate vicinity? This is a question we cannot answer definitely. In

[39] Anonymous, "Leaning lizards make smart moves," *Nature* 475, 7356 (2011): p. 268.
[40] Paur, "Autonomous Quadrotors."
[41] Peter W. Singer, "In the Loop? Armed Robots and the Future of War," Brookings Institution, accessed April 15, 2014, http://www.brookings.edu/research/articles/2009/01/28-robots-singer.

fact and as mentioned above, it is not possible to determine someone else's emotions or whether they are conscious. All we can be relatively sure of is that we are each individually conscious of our respective selves. It would be impossible to discern consciousness in robots. At best, we may be able to surmise that they possess *some* level of consciousness, which may be completely different than human consciousness,[42] based on the fact that they are able to perform tasks such as building block structures without running into one another for example.[43] Thus, the quadcopters probably do not reach their equivalent of self-awareness the same way Descartes does with his thinking. Nevertheless, they have in themselves something comparable to consciousness, allowing them to successfully accomplish difficult assignments analogous to birds when they fly in swarm with unequaled agility.

Artificial general intelligence and artificial *super*intelligence

(Narrow) AI already exists and is found in (nearly) all electronic and computerized devices we use in our daily lives. What do not yet exist, however, are AGI and ASI. Moreover, (financial) efforts to devise these technologies are far from parsimonious. The desire to build or engineer an entity (mainly a computer program) that would emulate the human intelligence has been present for decades in the scientific community. Turing's early work on learning machines is an expression of this.[44] The idea to contrive a form of intelligence in a body that would not be quite human predates Turing and can be found in the famous novel *Frankenstein, or, The modern Prometheus*, which was first published in 1818.[45]

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[42] Barrat, 2013, p. 46 points out that if and when AGI comes about, it will likely possess a quality that may be similar to consciousness, but will not be exactly it. That is, AGI will have something that produces the same effects consciousness would while being slightly distinct from consciousness. If we extrapolate this claim to AI (and ASI), we can hypothesize that any form of consciousness that would be found in AI (and ASI) could be recognized as such through *its effects* rather than *itself*.

[43] Paur, "Autonomous Quadrotors."

[44] Turing, "Computing Machinery."

[45] Mary Wollstonecraft Shelley, *Frankenstein, or, The modern Prometheus* (Cambridge, UK: Cambridge University Press, 1998). Since Shelley describes Frankenstein as being made of lifeless human body parts it is not clear whether the monster would fall under the post-human label. Nonetheless, her novel is indicative of an existing conception of a form of life—possessing some degree of intelligence—that would not be entirely human even though it is made of human components. Bruce Franklin (1988), p. 4) argued

Serious attempts at designing an AGI (with the hope of ultimately coming up with an ASI) have taken off around the end of the 1980s and beginning of the 1990s when scientists tried to devise neural networks, an artificial, computerized system that would work in a fashion analogous to the human brain.[46] David E. Rumelhart et al. explain that scientists from the AI community sought to create an AI that would possess "the intelligence of biological organisms."[47] The ultimate purpose of neural networks is to understand how neurons are connected with one another to transmit information in their multitudinous interactions within a biological brain.[48] Toshinori Munakata describes neural networks as "modeled on the human brain and [able to] learn by *themselves* from patterns."[49] It is that capacity to metaphorically learn — that is, acquire knowledge and skills — *independently* that makes neural networks so important. Let us recall the highest level of autonomy described by Singer, namely adaptive autonomy.[50] This type of autonomy involves a capacity to learn, which itself entails the possibility of an evolving AI, at some point possibly reaching the level of AGI or ASI. Hence, neural networks can self-improve.

So can genetic algorithms. Genetic algorithms are another form of advanced AI, which has not yet reached the stage of AGI. Munakata explains that this technology is based on the idea of natural evolution, which would explain why it is also referred to as "evolutionary computing."[51] While neural networks seek to improve themselves by building on existing knowledge that they acquired throughout their existence, genetic algorithms endeavor to alter their internal genetic sequences—which in essence are the

that before a technology or weapon could be invented it first needed to have been envisioned. Frankenstein was a visualization of a non-natural (or artificial) intelligence that approached the idea of AGI without clearly pinning it down.

[46] Kazuo Asakawa and Hideyuki Takagi, "Neural Networks in Japan," *Communications of the ACM* 37, 3 (1994): p. 106; David E. Rumelhart, Bernard Widrow, and Michael A. Lehr, "The Basic Ideas in Neural Networks," *Communications of the ACM* 37, 3 (1994): p. 87.

[47] Rumelhart et al., "The Basic Ideas," p. 87.

[48] Ibid., p. 88.

[49] Toshinori Munakata, "Commercial and Industrial AI," *Communications of the ACM* 37, 3 (1994): p. 25.

[50] Singer, *Wired for War*, p. 74.

[51] Munakata, "Commercial," p. 25.

numerous lines of codes within their software—so as to readjust themselves to their surroundings, which present them with continuous changes.[52]

Although both neural networks and genetic algorithms may show signs of self-improvement, they do so in distinct ways. Genetic algorithms do not learn *per se*. While they adapt to their environment, which itself is changing erratically due to a multitude of factors, they do not adapt because of their knowledge of this environment. A simple example should prove useful in elucidating how this is the case. Let us take the example of a species whose members have suffered repetitive sunburns due to several prolonged periods of unprotected exposure to sunlight. After a while (probably tens of thousands if not millions of years to be realistic), members of this species will pass on genetic information to their offspring that will result in an increased production of melanin, the substance responsible for darker skin pigmentation and that offers a natural protection to sunlight. The result for the species would be a higher tolerance to ultraviolet rays, rendering the members of that species less likely to get sunburns. Genetic algorithms function in a similar fashion—at a much faster pace. This is why it is also called "machine evolution."[53] The improvements generated by genetic algorithms are therefore reflexive instead of reflective. They are done without necessitating a conscious behavioral change from the subject in question.

Let us now take the same sunburn example and see how it applies to improvements engendered by neural networks. The fact that Russell and Norvig introduce neural networks in a chapter of their book entitled "Learning from Examples" is revealing of the logic behind that technology.[54] According to them, a being that possesses the ability to learn can "[improve] its performance on future tasks after making observations about the world."[55] This is precisely what neural networks do. They identify patterns in their environment, estimate how they could better deal with these patterns, and change their internal framework accordingly.[56] Bernard Widrow et al. explain that the "adaptivity" contained in neural networks enables them to

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[52] Ibid.
[53] Russell and Norvig, *Artificial Intelligence*, p. 21.
[54] Ibid., p. 693.
[55] Ibid.
[56] Bernard Widrow, David E. Rumelhart, and Michael A. Lehr, "Neural Networks: Applications in Industry, Business and Science," *Communications of the ACM* 37, 3 (1994): p. 104.

overcome the emerging changes of their environment, although the possibilities of neural networks are currently finite rather than infinite as they would likely be in the case of an ASI.[57] And so going back to the sunburn example, a neural networks-like approach to adapting to the protracted exposure to sunlight would be quite straightforward: members of the species would *learn* that unprotected exposure to ultraviolet rays leads to a higher risk of sunburns and would therefore seek protection, searching for shaded areas where sunrays are not as strong and sunburn risks are lower. Unlike that of genetic algorithms, this adaptation would be done reflectively.

Misha Tsodyks and Charles Gilbert explain that perceptual learning is an aspect of learning that is done reflexively by living organisms.[58] This learning process, which they assert is crucial to any attempts at faithfully emulating biological learning, consists of perfecting the art of perception via repetitive contacts with various stimuli.[59] Put simply, it is about becoming accustomed to sensory stimuli and therefore better able to metaphorically recognize them. Tsodyks and Gilbert add that current models of neural networks could profit from a more advanced stage of perceptual learning.[60] They argue that while certain models possess some perceptual learning abilities, these are nowhere near those of living organisms.[61]

Kazuo Asakawa and Hideyuki Takagi state that neural networks utilizations started to spread in the early 1990s in the Japanese commercial and industrial sectors.[62] Widrow et al. add that neural networks have also been used in the military sector, specifying that such uses are probably much more extensive and diversified than those of any other categories, but are kept secret.[63] As early as 1994, one known military use of neural networks was in missile guidance mechanisms, which not only enabled missiles

[57] Ibid.
[58] Misha Tsodyks and Charles Gilbert, "Neural networks and perceptual learning," *Nature* 413 (2004): p. 775.
[59] Ibid.
[60] Ibid., p. 780.
[61] Ibid., p. 775.
[62] Asakawa and Takagi, "Neural Networks," p. 106.
[63] Widrow et al., "Neural Networks," p. 96.

to be launched and led into their target more accurately, but also faster than if they had been fully human-controlled.[64]

David Grondin notes that information pertaining to national security is less easily accessible due to elements that — according to security experts — need to be kept (top-) secret to ensure the success of security measures.[65] Antonio A. Cantu argues that some technologies such as those utilized in counterterrorism should remain secret, for disclosing information about them could weaken them or even defeat their purpose.[66] While they do so in much shorter time lines, policemen work on a similar rationale when they turn off their sirens as they approach a crime scene to avoid advertising their arrival to the suspect who may still be in the whereabouts. Moreover, there is currently a movement—in the US (new) ways of war—in the direction of automating and robotizing weaponry and warfare as a whole—a trend that will be discussed at length in the second part of this paper. Cantu states that counterterrorism technologies have made use of AI and neural networks.[67] And as Asakawa and Takagi contend, "neural networks will be the heart of autonomous systems."[68] A last point is unequivocally worth mentioning: referring to the commercial aspect of counterterrorism technologies, Cantu argued that the market's demand for such tools was strong.[69] This was *before* 9/11. Thus, it is very likely if not definite that neural networks are already and will continue to be employed in a variety of other military technologies and applications.

A brief note on the automobile industry

The automobile industry is likely to be among the firsts to devise an ASI capable of learning and therefore self-improving. As early as 1994, researchers at Carnegie Mellon University were testing an Autonomous Land Vehicle In a Neural Network

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64 Ibid.

65 David Grondin, "The study of drones as objects of security: Targeted killing as military strategy," in *Research Methods in Critical Security Studies: An Introduction*, ed. Mark B. Salter and Can E. Mutlu (New York, NY: Routledge, 2013), p. 192.

66 Antonio A Cantu, "Counterterrorism Technology and Today's Threat," *Terrorism* 14, 2 (1991): p. 128.

67 Ibid.

68 Asakawa and Takagi, "Neural Networks," p. 111.

69 Cantu, "Counterterrorism," p. 129.

called ALVINN.[70] With the help of neural networks, ALVINN was able to park a truck—within a computer simulator program—with a decreased margin of error after every attempt it made, even when placed in a starting position it had never found itself in before.[71] In 2010, researchers were still using more sophisticated models of neural networks to control land robots. This time, however, the autonomous robots were not in a computer simulator. They were made of hardware, in a miniature robot called Khepera.[72]

In the September 2014 edition of *Motor Trend*, Alex Nishimoto gives us a taste of the future of the automobile industry, as Google announces its nearly fully autonomous car prototype to be tested on the roads in the imminent future.[73] The Google driverless car only requires a human to press its start button. The article does not go into details as to how exactly the car's autonomous system will function, but what is certainly most striking is the fact that it has "no steering wheel, accelerator, or brake pedal."[74] The former generation of driverless cars engineered by Google ran on "sensors, software, and Google's mapping database."[75] More research and experiments have yet to be conducted with neural networks and autonomous systems and it is too early to determine how effective Google's new cars will be, but should they prove successful these prototypes will represent a major step in the direction of self-learning

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[70] Widrow et al., "Neural Networks," p. 99.
[71] Ibid., p. 100.
[72] Peter Trhan, "The Application of Spiking Neural Networks in Autonomous Robot Control," *Computing and Informatics* 29 (2010): p. 824.
[73] Alex Nishimoto, "Google Unveils Autonomous Car Prototype," *Motor Trend* 66, 9 (2014): p. 22.
According to Tesla Motors (2015), seven automotive corporations, including Google, have been granted permits from the California Department of Motor Vehicles to test autonomous vehicles on public roads in California. While these "autonomous" vehicles are not proof of ASI, they are nonetheless indicative of an increasing interest in the automobile industry to design ever more autonomous technologies, which could help advance technological progress in other connected fields that work on (components that will make up) ASI.
[74] Nishimoto, "Google Unveils," p. 22.
[75] Alan S. Brown, "Google's Autonomous Car Applies Lessons Learned from Driverless Races," *Mechanical Engineering* 133, 2 (2011): p. 31.
For more on the abilities and potential benefits of Google's previous generation of driverless cars, see Sebastian Thrun's (2011) presentation on TED Talks. Also, to find out about Google's objectives regarding driverless cars see Alex Wright's (2011) article on automotive autonomy.

autonomous systems. Peter Trhan explains that research is now oriented towards autonomous *flying* robots.[76]

The Singularity (and artificial *super*intelligence)

What is the Singularity? It is that distinct point in history after which nobody can quite say what will happen exactly aside from saying that (almost) everything will certainly change. It is also a moment we cannot predict with great exactitude. In their thousand page long book, Russell and Norvig only mention this concept in passing, indicating that the Singularity is reached once computers' level of intelligence equals that of humans, which they acknowledge is a description that does not tell us much.[77] The Singularity consists of more than just that. In fact, Singer explains that in the field of astrophysics, this concept refers to a moment where new knowledge is made available that is so groundbreaking that it subsequently forces us to question all anterior knowledge.[78] For instance, when Albert Einstein discovered the theory of relativity it revolutionized the field of physics as a whole.[79] Raymond Kurzweil defines the Singularity as "a future period during which the pace of technological change will be so rapid its impact so deep, that human life will be irreversibly transformed."[80] To give us an idea of how important the Singularity is and how serious it is considered by political leaders, Singer even points out that it was the topic of discussion of a US Congress study in 2007, which was called "The Future Is Coming Sooner Than You Think."[81]

ASI is intimately linked with the Singularity because of the latter's exponential growth component. As per Barrat's definition, ASI is a type of intelligence that is beyond that of humans.[82] Once ASI is created, the possibilities for breakthroughs in every scientific and non-scientific field become not necessarily unlimited as we cannot tell for sure, but certainly disproportionately greater than they currently are. ASI will

[76] Trhan, "The Application," p. 825.
[77] Russell and Norvig, *Artificial Intelligence*, p. 12.
[78] Singer, *Wired for War*, pp. 102-103.
[79] Ibid., p. 103.
[80] Raymond Kurzweil, *The Singularity is Near: When Humans Transcend Biology* (New York, NY: The Penguin Press, 2005), p. 7.
[81] Singer, *Wired for War*, p. 105.
[82] Barrat, *Our Final Invention*, p. 8.

not simply build on existing knowledge in a linear; rather, it will do so in an ever-accelerating way. The Singularity is about technological changes that will be "expanding at an exponential pace."[83] This exponential rhythm also explains why it is impossible to ascertain how ASI will change the future (of drone warfare and counterterrorism) in all its intricacies. This does not mean that every prediction about the implications of the Singularity and ASI are necessarily flawed. It means that we simply have no way of knowing because while we may be making estimates that seem logical and not overstated nor understated, we build these extrapolations on *present* knowledge, not post-Singularity knowledge. For that reason, we may be including factors or variables that will no longer exist and/or leaving out others that simply do not exist yet.

Neil Gershenfeld puts it in a simple way, claiming "what Ray [Kurweil] does consistently is take a whole bunch of steps everybody agrees on and take principles for extrapolating that everybody agrees on and show they lead to things that nobody agrees on."[84] Experts have already made their bets regarding the consequences of the advent of ASI. They range from very optimistic[85] to quite pessimistic,[86] passing by more cautious, yet enthusiastic ones.[87]

Patently, there are currently a number of hurdles that will need to be circumvented before ASI and even AGI can be created. If there were not, AGI and ASI would likely already exist given the strong desires to bring them about. So what are existing forms of AI missing to become AGI or ASI then? More autonomy than they already possess? Neural networks that would be more powerful? Self-awareness? Consciousness? Intentionality? A passing mark on the Turing test? A mix (or perhaps *all*) of the above? Anything else? The answers to these questions may be decades away. And, even if we knew which ingredients were missing to make the recipe for AGI and ASI, it might not be as simple as putting them in the mixing bowl. Can you think of a way to incorporate consciousness in AI?

[83] Kurzweil, *The Singularity*, p. 8.
[84] Quoted in *Transcendent Man*, DVD (2009; New York, NY: Docurama).
[85] Kurzweil, *The Singularity*; Hans Moravec, *Robot: Mere Machine to Transcendent Mind* (New York, NY: Oxford University Press, 1999); *Transcendent Man*.
[86] Barrat, *Our Final Invention*.
[87] Singer, *Wired for War*.

The above obstacles are complex and their solutions are not self-evident, which would explain why experts' estimates regarding a timeline for the attainment of AGI and ASI do not all agree with one another.[88] As a student of the social sciences, my work concentrates on the political, ethical, and philosophical implications of ASI. Consequently, I deliberately leave these academic conundrums to those who they belong, namely computer scientists, cognitive scientists, engineers, neuroscientists, etc. To be clear, I am not arguing that social and political scientists should not pay attention to AGI and ASI or that the latter pair is not relevant to the former's respective disciplines; on the contrary, I insist that these technologies matter to all of us regardless of our fields of study. However, given the complexities of these technologies it is apropos to leave the task of figuring out how to overcome the (mechanical) difficulties they present to those who are best equipped to do so. Thus, I will not propose ways of fulfilling AGI or ASI. And so while I employ Barrat's definition of ASI throughout this paper, I cannot provide my reader with the exact components of this type of intelligence. Yet, I expect that the elements that have been discussed above will give my reader a comprehensive idea, however indefinite, of what ASI would involve. In the following subsection, I lay out the theoretical foundation of my paper, explaining how *jus in bello* together with virtuous war offer a tailored model of investigation for ASI drones.

A theoretical framework to suit ASI drones

The idea behind Asimov's three laws of robotics was that they would be ingrained within robots so that the robots would have no choice but to follow them at all time. In fact, the laws were to be "the three rules that are built most deeply into a robot's positronic brain."[89] The only problem: how do we (permanently) wire them into robots? Lee McCauley notes that while Asimov's laws are well known within the AI and robotics communities there is a near consensus that the laws simply have no real

[88] Barrat, *Our Final Invention*, pp. 196-197.
[89] Isaac Asimov, "Runaround," Rutgers University, accessed May 3, 2014, https://www.rci.rutgers.edu/~cfs/472_html/Intro/NYT_Intro/History/Runaround.html.

life use, for they "are not implementable in any meaningful sense."[90] Others highlight just how difficultly the laws were followed even in the tales of their author, which also contributed to the stories' intrigue.[91]

Until we figure out a way to input Asimov's laws into the core of every robot, it will be up to the humans who control these robots to apply the moral principles behind these laws or revised versions thereof.[92] McCauley even goes as far as comparing the allegiance that robot's human controllers should have towards the higher moral principles embedded in Asimov's laws to the Hippocratic Oath doctors take.[93] Those who, like Francis Hutcheson and Mencius, believe that human beings are capable of genuine benevolence will find that McCauley's suggestion is tenable.[94] Others, including myself, who think that Thomas Hobbes's view of the state of nature as being "solitary, poor, nasty, brutish, and short"[95] or Bernard de Mandeville's argument that vice is ubiquitous[96] are better diagnoses of the world will find that McCauley's normative position is simply idealistic.

In theory, Asimov's laws could apply to drones since they are robots. When it comes to drones like Predators and Reapers, which are equipped with Hellfire missiles that deliberately target, hit, and kill select human beings, however, any attempt at using the laws on their merits becomes futile—especially since the laws were not intended to apply to robots specifically designed to kill. Drones have been used by the US in ways that contravene Asimov's first two laws. This is not the case simply because these laws cannot be entrenched in robots. While Asimov's laws cannot be inputted in robots, it would not be impossible for the US to ask its drone pilots to be committed to using drones in a fashion that would still embrace the moral ideals behind the laws. Thus,

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90 Lee McCauley, "AI Armageddon and the Three Laws of Robotics," *Ethics and Information Technology* 9, 2 (2007): p. 153.

91 Michael Moran, "Three Laws of Robotics and Surgery," *Journal of Endourology* 22, 8 (2008): p. 1557; Robin R. Murphy and David D. Woods, "Beyond Asimov: The Three Laws of Responsible Robotics," *IEEE Intelligent Systems* 24, 4 (2009): p. 14.

92 McCauley, "AI Armageddon," p. 162.

93 Ibid.

94 Alejandra Mancilla, "The Bridge of Benevolence: Hutcheson and Mencius," *Dao* 12, 1 (2013): p. 57.

95 Thomas Hobbes, *Leviathan* (Peterborough, ON: Broadview Press, 2002).

96 Bernard Mandeville, *The Fable of the Bees: Or, Private Vices, Publick Benefits* (Indianapolis, IN: Liberty Fund, 1988), p. 20.

Asimov's laws *could* be used as a normative ethical parameter that would circumscribe the use of drones, should this be the design of the US drone war and counterterrorism campaign.[97] Again, this is *in theory*. In practice, there is plenty of evidence clearly indicating that this is *not* how the US employs its drones, nor aspires to.

When addressing the issue of drone strikes, President Obama declared that "America does not take strikes to punish individuals; we act against terrorists who pose a continuing and imminent threat to the American people."[98] This short passage encompasses the concept of self-defense, an idea at the heart of the 2001 joint resolution on the Authorization for Use of Military Force (AUMF). Defending the use of US strikes, the then Attorney General made clear references to the AUMF, stating that the US employed lethal force to *defend* itself.[99] Daniel Klaidman notes that, legally speaking, the AUMF has been the central pillar of the fight against al Qaeda since George W. Bush.[100] Military drones are and have been used for military operations and such tactical campaigns result in the death of individuals. Obama explains that the preference of the US is to capture rather than kill suspected terrorists, but that the former option is not always available.[101] Hence, the use of drones in line with Asimov's laws becomes out of the question when the latter alternative is chosen. Once ASI drones will be requested to carry out counterterrorism missions for the US government, the superpower is unlikely to ask them to be careful not to hurt anyone while they are on duty. It more likely will ask them to get the job done, meaning that it will sometimes inevitably result in some people getting killed. I therefore turn to theoretical models that are customized to military endeavors, namely *jus in bello* and virtuous war.

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[97] An updated version of Asimov's laws—such as one substituting the words "human being(s)" that are currently in the first two laws with the words "non-combatants" or "civilians"—could act as a normative framework for the use of ASI drones deployed in counterterrorism (or other military) missions. Yet, hardwiring these modified laws into drones would still pose a problem.

[98] Barack Obama, "President Obama Speaks on the U.S. Counterterrorism Strategy," White House, speech, Washington, DC, May 23, 2013, http://www.whitehouse.gov/photos-and-video/video/2013/05/23/president-obama-speaks-us-counterterrorism-strategy#transcript.

[99] Eric Holder, "Attorney General Eric Holder Speaks at Northwestern University School of Law," YouTube, speech, Chicago, IL, March 5, 2012, http://www.youtube.com/watch?v=aZX8rtuqMiw.

[100] Daniel Klaidman, *Kill or Capture: The War on Terror and the Soul of the Obama Presidency* (New York, NY: Houghton Mifflin Harcourt, 2012), p. 140.

[101] Obama, "President Obama Speaks on the U.S. Counterterrorism Strategy."

James Der Derian argues that virtuous war depicts current and future wars.[102] Virtuous war comprehends the US (Global) War on Terror, the US (new) ways of war, and the US counterterrorism strategy, as each has used technologies that can reduce battlefield risks for US soldiers and *in theory* can reduce collateral damage.[103] Virtuous war is a type of war that is likely to keep on being waged, for its potential, theoretical benefits are very appealing to the leaders higher up the military chain of command. Nick Turse and Tom Engelhardt argue that the current state of US foreign policy is characterized by a global war, producing what they call "a drone-eat-drone world,"[104] which is not close to being over. Medea Benjamin also uses the idea of a drone-eat-drone world, which she argues will be funded by US taxpayers.[105]

In an interview with Singer, Der Derian, who discussed drones and autonomous robotic systems more broadly, explained that "[i]f one can argue that such new technologies will offer less harm to us and them, then it is more likely that we'll reach for them early, rather than spending weeks and months slogging at diplomacy."[106] Now, there has been quite some criticism from various sources arguing that drone strikes are nowhere near as precise and as "civilian casualty minimizing" as the US claims them to be.[107] Taking this argument of impreciseness of drone strikes in consideration, the US virtuous war does not seem so virtuous after all, hence the diagnostic/sarcastic undertone behind Der Derian's concept of an allegedly "virtuous" war. Whether drones genuinely result in more "surgical" strikes with fewer casualties is beside the point, however.

What matters is the fact that the US does commend its counterterrorism strategy on these merits. That is, the US, whether because it sincerely believes in the virtuousness of its military campaign or simply pretends it does, uses virtuous war

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[102] James Der Derian, *Virtuous War: Mapping the Military-Industrial-Media-Entertainment-Network* (New York, NY: Routledge, 2009).
[103] Nick Turse and Tom Engelhardt, *Terminator Planet: The First History of Drone Warfare 2001-2050* (New York, NY: Dispatch Books, 2012), p. 55.
[104] Ibid., p. 97.
[105] Medea Benjamin, *Drone Warfare: Killing by Remote Control* (New York, NY: Verso, 2013), p. 45.
[106] Quoted in Singer, *Wired for War*, p. 321.
[107] Benjamin, *Drone Warfare*, pp. 104-105; Alex Neve, "The Human Cost of Killer Drones," speech, Ottawa, ON, November 25, 2013; Brian Glyn Williams, *Predators: The CIA's Drone War on al Qaeda* (Washington, DC: Potomac Books, 2013), pp. 115-118.

rhetoric to talk about its military objectives and achievements.[108] For instance, the President declares "[c]onventional airpower or missiles are far less precise than drones, and are likely to cause more civilian casualties."[109] Advocating his superior's position, Eric Holder adds that "the use of advanced weapons may help to ensure that the best intelligence is available for planning and carrying out operations, and that the risk of civilian casualties can be minimized or avoided altogether."[110] Military manufacturers also champion this argument, maintaining that the products they engineer minimize the risks usually present on the battlefield for the soldiers who employ them.[111]

Leaving the legitimacy of virtuous war aside for a moment, let us take as a given that drones indeed not only enable, but also cause fewer civilian casualties by bringing about more precise strikes. In the definition of virtuous war is the idea of a "technical capability" that renders a cleaner use of violence possible.[112] For this capability to actually produce the desired outcomes of virtuous war—more "surgicality" and less collateral damage—the technology supporting virtuous war needs to have the principles of *jus in bello*, namely proportionality and discrimination embedded in it. Without these, virtuous war simply becomes war.

In the second part of this paper, I canvass this desire to conduct war in a cleaner and more virtuous manner, which has been manifest in the US in the last few decades. I pay closer attention to the post-9/11 era and the Obama administration as the trend towards the automation and robotization of warfare has been more accentuated then.

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108 Saurette and Gordon (2013, p. 179) remind us that simply analyzing a discourse cannot help us pinpoint the reason(s) why an individual articulated that discourse. Hence, attempting to determine the rationale behind the US drone war and counterterrorism simply based on their discursive rhetoric is futile.

109 Obama, "President Obama Speaks on the U.S. Counterterrorism Strategy."

110 Holder, "Attorney General."

111 Boeing, "Defense, Space & Security," accessed September 9, 2014, http://www.boeing.com/boeing/defense-space/military/scaneagle/; iRobot, "Defense & Security," accessed November 22, 2013, http://www.irobot.com/us/learn/defense.aspx; Lockheed Martin, "Unmanned Systems," accessed September 9, 2014, http://www.lockheedmartin.ca/us/what-we-do/aerospace-defense/unmanned-systems.html; Northrop Grumman, "Unmanned Systems," accessed December 7, 2013, http://www.northropgrumman.com/Capabilities/Unmannedsystems/Pages/default.aspx; QinetiQ, "Unmanned Systems," accessed December 8, 2013, https://www.qinetiq-na.com/products/unmanned-systems/.

112 Der Derian, *Virtuous War*, p. xxxi.

PART II

Knowledge is seen as the key to "battlefield dominance," and

speed is seen as the key to exploiting that knowledge.

—Thomas K. Adams, US military strategist

To a drone world[113] and beyond

My objective in this section is threefold. First, I show that there is an existing US counterterrorism strategy that is not near its demise and is therefore relevant to study. Second, I trace the development of automated weaponry and the conduct of war (from afar), which characterizes the American (new) ways of war and is understood through Der Derian's concept of virtuous war. By using the word "trace" I do not mean to suggest that I will be looking at every single model or generation of weapons. There is just too many of them and it would not be feasible in the limited space I have. Furthermore, getting caught up in the almost interminable list of different weapons would not be productive. Rather, I am more interested in sketching the general trend towards the automation and robotization of warfare and counterterrorism. Third, I take that trend a few years if not decades beyond the present, to a point where the US virtuous war will reach what could be seen as its "logical culmination," namely when ASI is blended into its ways of war.

Singer notes that while the US only used a few drones at the beginning of the 2003 war in Iraq, it now employs thousands in its multiple military campaigns.[114] At the

[113] The term "Droneworld" refers to a not so distant future in which Ian Shaw (2012) believes there will be thousands of (non) military drones, which will be the aerial expansion of a long established network of US military bases across the globe. Droneworld is distinct from drone world in that Shaw's concept is inclusive of military and to some extent recreational drones too, while I refer exclusively to military drones, which can be used for surveillance, data collection, and/or targeted strikes. The drone world I write about most closely resembles the geographer's Predator Empire, which "bring[s] together the strategies, practices and technologies arranged around the deployment of drones for targeted killings" (Shaw 2013, p. 540).

time of writing his article, he estimated that around 7,000 drones and an additional 12,000 unmanned robots—such as those tasked to disarm improvised explosive devices also known as IEDs—were used by the US.[115] Singer published the latest of these two articles in July 2010, which is more than five years ago. Hence and given the rapid pace at which the US is reinforcing (and even replacing) its manned arsenal with unmanned equipment, it is very likely that the US is currently using a fleet of drones that is by many times greater than the one it had in 2010. In fact, Singer explains that the US relies on drones each time it carries out a tactical campaign, quoting an Air Force lieutenant who predicts that prospective military undertakings may be characterized by the deployment of squadrons comprising several thousand drones.[116] The above numbers and predictions only represent a brief survey of how much more the US is likely to depend on robots and drones in its future wars. The current breed of military robots employed by the US is nothing more than the tip of the iceberg.[117]

I will devote the largest portion of this second half mapping out this course towards a drone world and beyond. In the last subsection, I will extrapolate this tendency beyond the present use of unmanned systems in warfare and counterterrorism by the US, in what I argue is simply a logical continuation of the way war is being virtuously waged by the US. In other words, I am arguing in which direction the car would be headed if the US kept its right foot on the gas pedal with the same pressure it currently uses, but took its hands off the steering wheel. Doing so, I stretch the trend towards automation and robotization until it reaches a point where ASI becomes part of the equation, which of course only happens at a later indeterminate moment in (the US) military history.[118] But first, I will demonstrate that there is indeed an existing military campaign that relies on (semi-)automated robotic systems.

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[114] Peter W. Singer, "Gaming the Robot Revolution," Brookings Institution, accessed April 15, 2014, http://www.brookings.edu/research/opinions/2009/05/22-robots-singer; Peter W. Singer, "War of the Machines," *Scientifically American* 303, 1 (2010): pp. 57-58.
[115] Singer, "Gaming the Robot."
[116] Peter W. Singer, "Robots at War: The New Battlefield," *Wilson Quarterly* 33, 1 (2009c): pp. 35-36.
[117] Singer, "War of the Machines," p. 59.
[118] While I argue *where* the US ways of war are going, I do not take a position regarding *when* they will do so. I remain silent on that issue, given that the predictions concerning the advent of ASI represent an unsettled debate.

Terrorism is well alive, and so are the measures seeking to counter it

As I write these lines, videos of two US journalists being beheaded by a masked individual are circulating on the Internet and across various social medias.[119] The names of these journalists were James Foley and Steven Sotloff and the individual who allegedly executed them claims to be from the organization named Islamic State of Iraq and the Levant (ISIL).[120] Shortly after the release of these videos and on the eve of the thirteenth anniversary of the 9/11 attacks, the US President addressed his nation regarding ISIL. His opening sentence made the purpose of his speech very clear: "tonight I want to speak to you about what the United States will do […] to degrade and ultimately destroy the terrorist group known as ISIL."[121] Brookings Institution's Tamara Cofman Wittes was quick to note that the President did not actually express a theory of what he would do to vanquish ISIL.[122] However, what matters is that, throughout his brief 15 minutes address, Obama laid out the principal military aspect of his country's counterterrorism strategy to defeat ISIL. As he articulated it, "ISIL is a terrorist organization, pure and simple [… and] I ordered our military to take targeted action against ISIL to stop its advances."[123] I do not wish to initiate a definitional tirade here and will therefore not define "terrorism" nor will I try to determine whether ISIL fits any particular definition of the term.[124] According to the US, ISIL *is* terroristic and because the former regards the latter as such, the US' efforts to thwart ISIL fall under the category of counterterrorism.

Several times, Obama made explicit mentions to his previous counterterrorism campaign and implicit references to his administration's use of military drones, sometimes even employing the language that accompanies the concept of virtuous war.

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[119] I do not provide a reference here as these videos contain macabre scenes, which violate the terms and conditions of several websites on which they are posted and therefore subsequently removed from. Hyperlinks to one of these sources may be broken days or even hours after their creation, thus rendering futile any attempt at referencing one of these sources.

[120] Barack Obama, "President Obama Addresses the Nation on the ISIL Threat," White House, speech, Washington, DC, September 10, 2014, http://www.whitehouse.gov/photos-and-video/video/2014/09/10/president-obama-addresses-nation-isil-threat#transcript.

[121] Ibid.

[122] Tamara Cofman Wittes, "Around the Halls: Brookings Scholars React to Obama's Speech on ISIS," Brookings Institution, accessed September 19, 2014, http://www.brookings.edu/blogs/iran-at-saban/posts/2014/09/11-around-the-halls-scholars-react-obamas-isis-speech.

[123] Obama, "President Obama Addresses the Nation on the ISIL Threat."

[124] For more on criteria and definitions of terrorism, see David J. Whittaker (2004).

He reminded the American public that his government had killed Osama Bin Laden as well as highly ranked members of al Qaeda and other related nefarious associations in places such as Afghanistan, Pakistan, Yemen, and Somalia.[125] These are four countries where US drone strikes have been recorded and which represent the center of the battlefield when it comes to US counterterrorism.[126] Considering that these states are merely places were US drone strikes have occurred and therefore do not include the spaces where the (Global) War on Terror apparatus has been deployed—in places such as Guantánamo Bay (Cuba), Abu Ghraib (Iraq), and countless black sites in various locations around the world—it is no wonder Derek Gregory coined the term "the everywhere war."[127]

The American President declared that over 150 airstrikes had been fired by the US on ISIL, thus "sav[ing] the lives of thousands of innocent men, women and children."[128] These strikes do not represent the end of the US counterterrorism strategy against ISIL. In fact, the first component of Obama's fourfold strategy is to maintain a military pressure on ISIL via strikes—*from the air*—like those it conducted in Somalia and Yemen.[129] He subsequently specified that this strategy would not entail the need for soldiers to be on the ground.[130] This particularity is indicative of the desire to keep soldiers out of harm's way and while it is not crystal clear whether the US will hit ISIL using planes containing human pilots, unmanned drones, or a mixed fleet, this statement strongly suggests that drones will play a significant role in this ongoing counterterrorism strategy.

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125 Ibid.

126 Daniel L. Byman, "Why Drones Work: The Case for Washington's Weapon of Choice," Brookings Institution, accessed May 2, 2014, http://www.brookings.edu/research/articles/2013/06/17-drones-obama-weapon-choice-us-counterterrorism-byman; David D. Cole, "Drone Strikes: Are They President Obama's Guantanamo?," speech, Ottawa, ON, November 14, 2013; Grondin, "The study of drones."; Ian Shaw, "From Baseworld to Droneworld," Antipode Foundation, accessed September 21, 2014, http://antipodefoundation.org/2012/08/14/intervention-from-baseworld-to-droneworld/; Ryan J. Vogel, "Drone Warfare and the Law of Armed Conflict," *Denver Journal of International Law and Policy* 39, 1 (2010): p. 132.

127 Derek Gregory, "The everywhere war," *The Geographical Journal* 177, 3 (2011): p. 239.

128 Obama, "President Obama Addresses the Nation on the ISIL Threat."

129 Ibid.

130 Ibid.

Moreover, at the time of his National Defense University speech, Obama[131] was seeing the threat on America as coming from a weakening al Qaeda, yet he now[132] perceives the main danger of terroristic nature as originating in ISIL. It was during this speech in Washington, D.C. that Obama clearly acknowledged the lethal use of drones by his administration.[133] He then explained that the superpower's drone strikes were performed in the context of a war against al Qaeda (and its allies) and were part of a broader counterterrorism strategy. In another recent speech on terrorism, Obama pointed out that ISIL used to be an ally of al Qaeda.[134] Thus, efforts at defeating ISIL are nothing more than the continuation of a long endeavor to eradicate (major) terrorist organizations and the names these organizations give themselves or the individuals that comprise their membership then become absolutely irrelevant. These elements are trivial because a strategy that seeks to counter al Qaeda or ISIL is a *counterterrorism* strategy so long as the members of these groups are regarded as terrorists by the US, as in these two cases.

Ellen Meiksins Wood argues that a war against terrorism simply cannot be won, for the goal of defeating evil is unrealizable.[135] She adds that by setting an objective such as that of countering terrorism creates a "war without end."[136] Notwithstanding Obama's essay to draw the idea of the Global War on Terror to an end,[137] the US is still employing the same methods it did under the umbrella of the Global War on Terror. Carol Cohn explains that when you talk about the damages an incendiary or nuclear bomb inflicts on a populated city in terms of "mass murder" instead of "collateral damage" you are suddenly talking about a totally different thing, metaphorically speaking.[138] In raw reality, however, you are talking about the same bomb and the same

[131] Obama, "President Obama Speaks on the U.S. Counterterrorism Strategy."

[132] Obama, "President Obama Addresses the Nation on the ISIL Threat."

[133] Obama, "President Obama Speaks on the U.S. Counterterrorism Strategy."

[134] Obama, "President Obama Addresses the Nation on the ISIL Threat."

[135] Ellen Meiksins Wood, "Infinite War," *Historical Materialism* 10, 1 (2002): p. 9.

[136] Ibid., p. 8.

[137] David Grondin, "The Other Spaces of War: War beyond the Battlefield in the War on Terror," in *War Beyond the Battlefield*, ed. David Grondin (New York, NY: Routledge, 2012), pp. 1-2; Barack Obama, "Barack Obama's Inaugural Address," The New York Times, speech, Washington, DC, January 20, 2009, http://www.nytimes.com/2009/01/20/us/politics/20text-obama.html?pagewanted=all&_r=0; Obama, "President Obama Speaks on the U.S. Counterterrorism Strategy."

[138] Carol Cohn, "Sex and Death in the Rational World of Defense Intellectuals," *Signs* 12, 4 (1987): p. 709.

thousands of dead people. Ergo, putting aside the label of the Global War on Terror is simply a matter of framing, which may change the perception of the phenomenon we conceive in our heads, but it certainly does not change the crude reality on the battlefield especially if the same strategy and the same weapons are used. Grondin draws attention to the fact that the Obama government attempted to swap the tag "Global War on Terror" for that of "Overseas Contingency Operations," not trying to determine whether this conceptual change is synonym with the (possible) end of the Global War on Terror.[139]

Given that the US plans on using airstrikes against ISIL like it did with al Qaeda, one can confidently hypothesize that the US finds efficacy in that approach and will therefore likely embrace it when it comes to defeating whichever terrorist organization takes the place of a vanquished ISIL. And so my point here is that drone strikes will keep on being used in counterterrorism, an argument that has already been articulated by others.[140] Obama's address to the nation reinforces that position, hence increasing the timeliness of my research's relevance to the field of security studies.[141] But what is it exactly that the US values in this modus operandi? It admires and strives for (a metaphorical) military cleanliness, which can then, in theory, nurture virtuousness. And virtuous war is more effectively achieved through the delegation of military assignments from human to non-human actants of war, namely robots. In the following section, I look at this transfer of martial task in more details, locating it in the US ways of war.

Are the US new ways of war really new?

Emily O. Goldman explains that, "[w]hile change in the ways of making war is an evolutionary process, periodically a state will succeed in exploiting an integrated set of military inventions and demonstrating clear superiority over older techniques of battle."[142] Vice Admiral Arthur Cebrowski argues that the advent of information

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[139] Grondin, "The Other Spaces of War," pp. 1-2.
[140] Byman, "Why Drones Work."; Shaw, "From Baseworld to Droneworld."
[141] Obama, "President Obama Addresses the Nation on the ISIL Threat."
[142] Emily O. Goldman, "New Threats, New Identities and New Ways of War: The Sources of Change in National Security Doctrine," *Journal of Strategic Studies* 24, 2 (2001): p. 48.

technologies, particularly advanced in the US, holds the potential to significantly upgrade the US ways of war.[143] When information technologies are mingled with weapons, the latter's enhancement is similar to that explained by Goldman. Suddenly, soldiers who find themselves on Iraqi or Afghan soil no longer seem to be thousands of kilometers away from the US homeland; instead, they are in the earphones and on the computer screens of their commanders at a base somewhere on US territory (or elsewhere in the world). Distance does not seem to matter as much anymore. Goldman adds that, "[i]mprovements in core technologies like precision guided munitions, surveillance satellites, and remote sensing, combined with advances in the speed, memory capacity, and networking capabilities of computers, form the foundation for a fundamentally new way of war."[144] While the capabilities currently contained in drones that are linked with one another via digital networks such as those engineered by the University of Pennsylvania roboticists do not necessarily enable a flawlessly precise exercise of violence, they nonetheless capacitate a drastic enhancement of warfare techniques. Singer argues that robots are a game changer.[145] Cebrowski goes as far as averring that, "the advent of interconnectivity is comparable to the advent of fire."[146] Military manufacturers like Boeing, Lockheed Martin, and Northrop Grumman to name a few are most certainly already working on new prototypes of always more intelligent drones that will outcompete their predecessors.

In that sense, the denomination "new ways of war" utilized by Grondin among others does indeed make sense.[147] The emergence of *new* technologies makes possible their combination with existing military contrivances, leading to the creation of an upgraded breed of weapons, which subsequently gives the means to conduct warfare in a *new* fashion, hence the idea of "new ways of war." However, this concept may also be somewhat misleading due to the fact that it entails the notion of novelty. While new technologies have indeed been employed by the US, hence shaping its ways of war, it is important to note that there is an element of continuity in the US (new) ways of war. This continuousness can be found in a long established desire to make a certain aspect

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[143] Singer, *Wired for War*, pp. 180-181.
[144] Goldman, "New Threats," p. 52.
[145] Singer, "War of the Machines," p. 60.
[146] Quoted in Der Derian, *Virtuous War*, p. 131.
[147] Grondin, "The study of drones," p. 193.

of virtuous war a reality, namely the aspiration to "actualize violence from a distance."[148]

Ian Shaw emphasizes that "unmanned aerial vehicles are definitely *not* [original emphasis] new technologies—their modern incarnation dates back to [the] Vietnam [War]."[149] In fact and as Singer explains, the desire to wage war from afar goes as far back as the days of Thomas Edison and Nikola Tesla when the two scientists were involved in a race for the creation of remotely controlled machines that would be commanded through radio signals.[150] Of course, a mere desire to design a certain gadget is not in and of itself sufficient to result in that tool's creation. Technological progress is (often) not linear and it can sometimes take years if not decades for a scientific project to yield the results that its initiators had in mind. AGI and ASI are one perfect example of that. Moreover, progress in one field is sometimes dependent on a breakthrough in another domain, as is also the case of AGI and ASI, which are contingent on the advances in several areas of science. However and as Singer plainly phrases it, "what was technically possible mattered less than whether it was bureaucratically imaginable."[151] The opposite of Singer's statement comes down to saying: "when there is a (governmental) will, there is a way."

The peaks of Edison and Tesla's respective scientific careers took place in the years leading to World War I, which was "more deadly, [and so] unmanned weapons began to gain some appeal."[152] Hence, there was the foundation of a governmental will. The first discussions among security experts in the US regarding the possibility of robotizing the battlefield by sending autonomous robots instead of soldiers took place at the beginning of the 1970s, however.[153] The bloodshed that took place during the

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148 Der Derian, *Virtuous War*, p. xxxi.

149 Shaw, "From Baseworld to Droneworld."

For the purpose of this paper, it is not necessary to trace or locate the inception of unmanned aerial vehicles. Simply pointing out the non-newness of drones suffices to support my broader argument, namely that there is a long existing trend towards the implementation of direct force from afar.

150 Singer, *Wired for War*, p. 46.

151 Ibid.

Singer made that statement in the context of a situation where Tesla explained to a Washington official that he had made some technical progress in his laboratory, but that it seemed far-fetched that it would be implementable by the bureaucracy. Hence, Tesla's idea was dismissed despite its scientific feasibility.

152 Ibid., p. 47.

153 Singer, "War of the Machines," p. 57.

Vietnam War activated the governmental will to develop unmanned robots. Such weapons enabled those who employed them to strike their opponents while remaining in a protected zone. Distance is key. Let us take the example of a boxing match where one fighter measures 5′11″, the other 6′4″, and the rest of their physical characteristics are relatively similar. Which boxer is most likely to win? The tallest because his arms will be longer and so will the reach of his punches. Again, distance is key, which is why the advent of military technologies like machine guns and tanks that increased the distance between combatants changed the way wars were conducted.[154] Prior to these inventions, soldiers fought in close combats that posed great risks to them as killing an opponent meant putting oneself in the enemy's range. Rudimentary inventions such as bows and arrows changed the game, for an archer could kill from afar. Machine guns, tanks, and bombers only magnified this technical advantage. Today's Predators and Reapers represent the archetypical separation between military rivals, simultaneously embodying the logic behind virtuous war.

However, can this distancing be stretched even further? Theoretically, yes. By removing the human from the kill loop through a total delegation of a license to kill to a machine. In other words, by granting robots complete lethal autonomy. I argue that doing so would be most effectively achieved through ASI drones, and the creation and deployment of these futuristic weapons is nothing more than the logical continuation of a resoluteness to conduct war and counterterrorism virtuously. While this may not actually increase the physical distance between those effectuating the killing and those being killed—for planet Earth is spherical and there is therefore an actual maximum distance between two points on its surface—it will ensure that the population of the side on whose behalf the robots are doing the killing is made as unaware as possible of the slaying. Not only will the use of these weapons help save the lives of those employing them, it will also censor killing as a whole for them. That is, as those living on Elysium[155] became oblivious to the poverty and suffering still rampant on Earth, war

[154] Singer, *Wired for War*, p. 100.

[155] According to the poems of Hesiod and Homer, Elysium refers to a place of abundance where select heroes—after having been chosen by the Gods—were sent to live for eternity, away from the miseries of Hades' underworld (Marinatos and Wyatt 2011, p. 385). Also, in the movie *Elysium* (2013) poverty and diseases have spread across Earth, rendering the planet unviable. To remedy the situation, Elysium, an artificial land in the form of a giant rotor, is built and placed above Earth. Elysium admits only those who

and counterterrorism will carry on without those employing ASI drones even knowing that they are. This is the apogee of cleanliness, enabled through an absolute reliance on killer robots to effectuate the killing. Current research on drones concentrates on the post-traumatic stress disorder from which drone pilots suffer due to the nature of their work.[156] As nightmarish as the above scenario may sound, this complete delegation of lethal decision-making to robots would be a way of keeping soldiers out of *psychological* harm's way—a step closer to the clean exercise of violence. However, as Der Derian points out, "in the final analysis that it seeks to evade, virtuous war is still about killing others."[157] And of course, such military strategy has profound ethical implications, which will need to be addressed by scholars and policy makers.

Towards harder, faster, and stronger drones

Shaw's main argument is that the American exercise of military power is shifting from a previous reliance on military bases *on the ground* to drones *in the sky*, hence the title of his article "From Baseworld to Droneworld."[158] Because the US had military bases spread out across the globe, the superpower could quickly intervene or apply its power virtually anywhere. However, these interventions still necessitated human soldiers to be mobilized. In Droneworld, this necessity is fading, as military technologies grow more intelligent. This represents a continuum that leaves space for an incremental, and sometimes abrupt, decrease on the reliance of human beings. In fact, Droneworld is a flying, mobile, and unmanned version of Baseworld, allowing for a much faster and risk-free exercise of military might. For instance, Lockheed Martin's High-Altitude Airship, which is designed to fly at high altitudes as its name reveals, can remain in flight for up to months at the time without having to land to refuel.[159] The

can afford to pay for an exorbitantly expensive spacecraft trip to it. Equipped with technology that can heal (almost) any disease, it is populated exclusively by the rich and the doctors ensuring their survival, hence leaving the poor and suffering population behind. The happiness generated on Elysium renders its inhabitants impervious to the suffering they once experienced.

156 Amy E. Eckert, ""We See Everything": Drone Operators, PTSD, and the Human Experience of War," paper presented at the Annual Meeting of the International Studies Association West, Pasadena, CA, September 26-27, 2014.

157 Der Derian, *Virtuous War*, p. xxxiii.

158 Shaw, "From Baseworld to Droneworld."

159 Singer, "War of the Machines," p. 60.

VULTURE, an acronym that stands for "Very-high-altitude, Ultra-endurance, Loitering Theater Unmanned Reconnaissance Element," is a project initiated by DARPA and which is expected to be able to stay in flight (or perhaps it would be more appropriate to say *in orbit*) for periods of five years.[160] Benjamin even alludes to drones that "will be able to remain airborne indefinitely."[161] Given the high level of secrecy around such technologies, it is not clear whether they have already been put in the sky and, if so, whether they have met the expectations of their creators.[162] These projects certainly open the door to another level of drone warfare. Once the US decides that it should equip its High-Altitude Airships and VULTUREs with lethal power, such as with the Hellfire missiles found on Predators and Reapers, the science fiction flavor of S.H.I.E.L.D.'s drones from the movie *Captain America: The Winter Soldier* will start waning pretty fast.[163] I am not even talking about ASI drones, which will be the systematic continuance of a desire to fight *à la* Der Derian.

Counterterrorism is the driving force behind the virtuous war rationale. While the objective of sending robots on the battlefield to spare human lives has been present in the mind of US politicians, engineers, and military manufactures for a relatively long period of time, the attacks on US soil that took place on September 11, 2001 acted as a catalyst on this governmental will to devise cleaner, robotic weapons.[164] Ty McCormick locates the beginning of killer drones in 2001, when the now (in) famous Hellfire missiles were added to drones.[165] McCormick adds that in November 2002, the US performed a strike outside of the formal context of war, an unexampled action that

[160] Benjamin, *Drone Warfare*, p. 48; Singer, *Wired for War*, p. 117.
[161] Benjamin, *Drone Warfare*, p. 19.
[162] The X-37B, a joint project between Lockheed Martin and Boeing, is a space drone, which recently completed a top-secret mission for the US government that lasted 22 months (see Yuhas 2014).
[163] *Captain America: The Winter Soldier*, DVD (2014; Los Angeles, CA: Walt Disney Studios Motion Pictures).
The three gigantic A(S)I-equipped drones portrayed in the movie likely represent the quintessence of the future of the US counterterrorism strategy, as their purpose was to obliterate every single enemy of the US. In fact, S.H.I.E.L.D.'s rationale for putting these weapons in the sky was that once they would be in function no one could take them down since they would be too powerful and could eliminate anyone attempting to destroy them. Put simply, these massive drones would have enabled S.H.I.E.L.D. to keep a permanent edge on their enemies.
[164] Benjamin, *Drone Warfare*, p. 16.
[165] Ty McCormick, "Lethal Autonomy," *Foreign Policy* 204 (2014): p. 18.

marked the beginning of drones being used at the heart of counterterrorism.[166] Furthermore, Singer specifies that the primary issue in the military following 9/11 was to acquire as many robots as possible and deploy them so that US soldiers would be out of harm's way.[167] This is the essence of virtuous war, aptly captured by Benjamin who argues that,

> [t]he main advantage of using drones is precisely that they are unmanned. With the operators safely tucked in air-conditioned rooms far away, there's no pilot at risk of being killed or maimed in a crash. No pilot to be taken captive by enemy forces. No pilot to cause a diplomatic crisis if shot down in a "friendly country" while bombing or spying without official permission.[168]

However, sending a drone instead of a human flying a F-15 for instance is not sufficient. The drone has to be precise. The higher the lethal precision, the cleaner the strike becomes, and the more virtuous the war comes to be. But higher precision requires more reliable intelligence on which decisions can be taken. In fact, to be effective killers, drones need to know where, when, and who to target, thus relying on the intelligence humans provide them and "for all their advanced optics and loitering capacity, [... drones are] only as good as their intelligence."[169] The US is already working to solve that practical hiccup, engineering the Gorgon Stare, a surveillance system employing twelve high-resolution cameras enhancing Reapers' vision, originally using a single camera.[170] And because war can never be too clean, DARPA is on its way to devising ARGUS, which is somewhat similar to a second generation of Gorgon Stare, its main upgrade being its ninety-two high-resolution cameras.[171] Akin to every new software update on our personal computers, the Gorgon Stare and the ARGUS are likely to experience various types of malfunctions, which will result in their diminished effectiveness and/or accuracy. Yet, based on the current trend in the manufacturing of military drones, the US is doubtlessly conceiving Gorgon Stare 2.0 and ARGUS 2.0, or

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166 Ibid., p. 19.
167 Singer, "War of the Machines," p. 59.
168 Benjamin, *Drone Warfare*, p. 18.
169 Williams, *Predators*, p. 37.
170 Noah Shachtman, "Air Force to Unleash 'Gorgon Stare' on Squirting Insurgents," Wired, accessed September 22, 2014, http://www.wired.com/2009/02/gorgon-stare/.
171 Turse and Engelhardt, *Terminator Planet*, p. 40.
For more on DARPA's ARGUS project, see Hambling (2009).

whatever next breed of drones. In short, if a given model is not as precise as the US wants it to be, the superpower is likely to keep tuning it.

According to Turse and Engelhardt, the US Air Force's foremost aim regarding military research and development is to "rule the skies with MQ-Mc drones and 'special' super-fast, hypersonic drones for which neither viable technology nor any enemies with any comparable programs or capabilities yet exist."[172] The Air Force expects that it will have reached this ambitious objective in 2047.[173] While this would have sounded like pure science fiction a few years ago, recent progress in the field of AI suggests that this drone world is in fact not too far away.[174] To top it off, Turse and Engelhardt predict that, if the Pentagon adheres to its master plan and remains as militarily enterprising as it currently is, in 2047 it will be working towards its 2087 goals.[175] It seems that the US is taking part in an arms race *with itself*, akin to the early portrayal of Scrooge McDuck whose main aspiration was to become richer *ad infinitum*, even though he was already the wealthiest Walt Disney character.[176] Unlike Scrooge who could attain his objective by simply waiting for the return on his investments, the US needs to keep on innovating if it wishes to have an everlasting state-of-the-art military, a durable edge Singer maintains is not achievable.[177] In the next section, I will argue against Singer's position, showing why ASI drones are the extension of the US virtuous war.

Why ASI drones are a logical continuation of the US quest for war virtuousness

For students, the advent and democratization of online databases meant that they no longer had to go through the shelves of a library as they could now retrieve (most) information through the Internet, download it, and bring it with them anywhere

[172] Turse and Engelhardt, *Terminator Planet*, p. 44.
[173] Ibid.
[174] McCormick, "Lethal Autonomy," p. 18.
[175] Turse and Engelhardt, *Terminator Planet*, p. 45.
[176] David M. Ewalt, "The 2013 Forbes Fictional 15," Forbes, accessed September 23, 2014, http://www.forbes.com/sites/davidewalt/2013/07/31/the-2013-forbes-fictional-15/.
[177] Alan S. Brown, "The Drone Warriors," *Mechanical Engineering* 132, 1 (2010): p. 27; Singer, "War of the Machines," p. 60.

they went so long as they had access to a computer connected to the Web. It also meant, however, that they would have to go through the extensive amount of useless data disseminated online, hunting for the articles that contained the information they needed. In itself, this pinpointing exercise could be a challenge, since when conducting research there is usually a greater quantity of unwanted information than there is of desired one rather than the other way around. And so the quest to finding the few articles that will be useful to write a term paper on topic X can end up being similar to searching for a needle in a haystack.

The twelve and ninety-two cameras, with which the Gorgon Stares and ARGUSes are respectively equipped, create a similar and more accentuated problem for the US military than online databases did for students. In fact, theses cameras will be producing a tremendous quantity of video footage, creating intelligence that the US will have to assess meticulously to be able to base military actions or counterterrorism measures on it. Turse and Engelhardt substantiate this point, maintaining that the ARGUS would simply generate an overwhelming amount of video data.[178] Others have also addressed this inevitability of an information overspill, arguing that the logical (although not necessarily moral) solution to this problem lies in granting more (lethal) autonomy to machines.[179] The calculation is straightforward: for every hour spent on a mission, an ARGUS drone would produce ninety-two hours of video. Also, it is improbable that the US will acquire only one ARGUS drone. The numbers discussed at the beginning of this section concerning the increasing amount of drones (and robots) employed by the US evince that there will be hundreds if not thousands of ARGUSes flying simultaneously to cover larger areas of the sky. Such a fleet would literally produce millions of hours of video, rendering any attempt by human beings to analyze them exacting, if not counterproductive. Hence and for lack of ASI, the most advanced AI systems become quite appealing.

Singer argues that integrating AI technology with surveillance systems would contribute significantly to the latter.[180] The ARGUS technology comprises of one such

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[178] Turse and Engelhardt, *Terminator Planet*, p. 40.

[179] Thomas K. Adams, "Future Warfare and the Decline of Human Decisionmaking," *Parameters* 41, 4 (2011): p. 9; Daniel Suarez, "The kill decision shouldn't belong to a robot," TED Talks, June 2013, http://www.ted.com/talks/daniel_suarez_the_kill_decision_shouldn_t_belong_to_a_robot.

[180] Singer, *Wired for War*, p. 274.

surveillance system that could benefit from an AI enhancement. However, the utilizations surveillance mixed with AI that Singer anticipates are relatively modest. To be sure, he expects that security cameras such as those found in large cities will be able to identify behaviors that suspiciously stand out and alert the police force.[181] Granted, this would certainly represent an improvement of policing techniques, making interventions more effective as police would know where and when to get involved, but let us apply this logic to the ARGUS. Once an AI-equipped ARGUS drone would locate a potential terrorist it would have to relay the information to a human controller sitting at a Nevadan military base in front of a monitor containing a myriad of screens. The system would show a signal on the screen(s) in which the potential terrorist is broadcasted. The controller would then have to assess the information and decide whether (s)he should intervene.[182] Should (s)he choose to act, (s)he would send a drone, which may or may not be the one which spotted the terrorist in the first place, to carry out the strike—keeping in line with virtuous war's clean exercise of violence *from afar*.

However, the main problem with the "kill loop" described above is that it is too long and decisions are made too slowly. While Singer is most certainly accurate by stating that "[t]he real breakthrough in counterterrorism may come from combining automated and artificial intelligence systems with our broader network of surveillance,"[183] he needs to take one more step down the path of lethal autonomy—which he does elsewhere[184]—to understand where this trend is going. The real value of AI combined with surveillance systems is unveiled once drones are given James Bond's 00 status. A license to kill—signifying that drones would not need an authorization to kill before every strike—would unleash enormous military potential, which would itself enhance the "technical capability [… to] actualize violence from a distance."[185] The ability to fully delegate a lethal task to a computer has existed for some time already,

[181] Ibid.
[182] According to Singer (2009b; 2010, p. 63), drone pilots tend not to question the validity of the data that is digested for them by a computer or robot. Hence, they are very likely to simply follow whatever advice the computer or robot offers them. If pilots blindly assent to the evidence that is brought to them by a machine, then it becomes useless to even bring that evidence to their attention in the first place. At that point, "the operator really only exercises veto power" (Singer 2010, p. 63).
[183] Singer, *Wired for War*, p. 273.
[184] Singer, "In the Loop?"
[185] Der Derian, *Virtuous War*, p. xxxi.

dating back to the Aegis computer used to defend Navy ships in the 1980s.[186] Singer argues that as computerized and robotized systems grow more autonomous, "the human power 'in the loop' [becomes] actually only veto power."[187] He adds that more often than not, humans are simply too slow to act on time and make use of their veto anyways. If the US decides to withhold the authorization to kill and always requires that a human controller make the final decision to shoot (or not), the robot may be shot down by the enemy precisely because valuable seconds will have been spent by the human to choose whether to shoot—a decision it no longer needs to make. Hence, the decision to keep a human in the loop becomes one that is merely symbolic rather than strategic or moral.

In a reaction involving several chemical elements and compounds, the substance that is contained in the least quantity, in an unbalanced equation containing all the reagents, is called the limiting reagent. It prematurely terminates the chemical reaction although certain quantities of the other reagents have yet to be consumed. There are two possible options to restart the reaction: using a greater quantity of the limiting reagent or substituting it with another reagent that possesses analogous chemical properties. And so as robots become stronger, faster, more intelligent, more lethal, more capable, and more [fill in the blank] than humans, the latter become the limiting reagent. Unlike in chemistry, however, adding more human to the equation will not restart the reaction. Thus, (adaptive) autonomy becomes the most effective substitute.[188] Restraining the new capacities and features of these augmented robots to the level of what humans can do simply defeats the purpose of why these machines were upgraded in the first place.

Singer puts forward several other arguments explaining why full autonomy is a logical (and inevitable) course of action in warfare and counterterrorism.[189] I will not list them, as it would become a mundane enumeration of points that have already been made. Each of these arguments is compelling and considered jointly they strongly suggest that full automation of military robots seems guaranteed. Of course, there is political opposition. Thomas K. Adams, who also argues that the automation of lethal

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186 Singer, "In the Loop?"

187 Ibid.

188 Adams, "Future Warfare," p. 9.

189 Singer, "In the Loop?"

robots is inevitable, presents a key, strategic argument that could get the US to simply dismiss any political dissent and move forward with a plan to designing and deploying a hefty fleet of ASI military drones, or at the very least fully automate its military drones and other robots.[190] His argument implies a victory of pragmatism over morality as he claims that once a "less moral" enemy realizes the potential of removing humans from the decision-making loop and decides to unleash it, the "more moral" side will have no choice but to unleash it as well. This creates a potent incentive to be the first to free this capability, favoring the (creation of the means for) offense.[191]

The speed and processing power of computers and military robots will surpass human capacities and, according to Adams, the logical continuation of the robotization and computerization of warfare is a world in which humans will no longer be in control[192]—another way of saying utmost automation. When this happens, warfare will have moved away from what Adams call the "human space." Yet, what happens once war leaves the human space and that humans are simultaneously removing themselves from war—as they increasingly distance themselves from the battlefield? Can there ever be a final plateau in military innovation, leading to a permanent status quo? As I alluded to in the previous section, Singer argues that "[i]n technology, there is no long-term first mover, advantage."[193]

While I am tempted to agree with Singer's statement given the many pioneering inventions that have been emulated shortly after their creation, I wonder if it will *always* hold true. What about a technology that is so powerful that it is able to learn and evolve, consequently defeating any potential (non-)state enemy that would seek to

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190 Adams, "Future Warfare," p. 11.

191 Stephen Van Evera (1998, p. 16) argues that the idea of offense dominance contains an inherent circular perpetuity. That is, offense dominance can self-generate. Thus, if the potential of *fully* autonomous weapons creates an incentive to be the first player to have them, and that their possession leads to (a perception of) offense dominance, then there is an even greater incentive to be the first one to take control of them.

192 Adams, "Future Warfare," p. 8.

193 Quoted in Brown, "The Drone Warriors," p. 27.
Singer's position is supported by the economical argument put forward by Paul Kennedy (1987, p. 533) who maintains that the US' somewhat improvident military expenditures demonstrate how a long-term hegemony is not viable. I will not expatiate on Kennedy's rationale aside from conceding that it is cogent. Yet, I argue that ASI drones could prove him wrong.

counter it *before* it even acquires the means to do so? Here, I am thinking about a fleet of fully autonomous ASI drones that could ameliorate their lethal abilities after each of the missions they would be sent on, akin to ALVINN's parking skills. Would not such a technology assure whoever controls it to remain the apex forever? I think so. For instance, if nuclear-armed state M continuously nukes state Q — somewhat akin to the US consecutive bombings of Hiroshima and Nagasaki — whenever the latter starts developing a technology that could pose a risk to the former, therefore compelling Q to stay in the Stone Age, M is guaranteed to stay ahead without continuously having to develop new types of weapons. Yet, M is unlikely to nuke Q incessantly as the damage to Q would be far disproportionate. Also, nuclear bombs are not in line with the idea of virtuous war—although the technostrategic language used by defense intellectuals suggests so[194] — for they are not engineered to be precise and they generate an excessive amount of death. However, if it had a fleet of fully autonomous ASI drones, M could deploy them and keep Q in a perpetual check, without the collateral damage. These drones would *surgically* target key elements of Q's means of producing weaponry. Plus, counterterrorism would not benefit much from relying on nuclear weapons, but definitely would gain should it bank on a breed of weapon that could eventually inflict unerring force because it would continuously get better at doing what it is it does, namely exercising violence in an ever cleaner way. Didier Bigo who studies (cyber) surveillance, explains that several states, including the US, have increasingly relied on comprehensive online data gathering to counter terrorism.[195] While I do not discuss them here, non-lethal cyber-weapons such as cyber-surveillance are also worth considering, because for ASI drones to act, they need intelligence on which to act in the first place. This intelligence can be obtained via such types of surveillance—at least according to the US.[196]

I, therefore, argue that this is where the US ways of war and counterterrorism strategy are headed. The arguments I presented above concerning the likelihood of (full) automation of warfare are weighty and strongly intimate an end that seems inevitable. Although this is just a theoretical extrapolation, the fact that it is based on a

[194] Cohn, "Sex and Death."
[195] Didier Bigo, "After Snowden: Rethinking the Impact of Surveillance," speech, Ottawa, ON, October 6, 2014.
[196] Adam D. Thierer and Clyde Wayne Crews, "Cyber-Surveillance in the Wake of 9/11," CATO Institute, accessed October 26, 2014, http://www.cato.org/publications/commentary/cybersurveillance-wake-911.

logical continuation of the US *current* ways of war calls for a serious discussion on the implications such a grand strategy—assuming it were implemented—would have not only in terms of military ethics, but also for the field of International Relations as a whole. This is a task for scholars and policy makers alike.

Bibliography

Adams, Thomas K. "Future Warfare and the Decline of Human Decisionmaking." *Parameters* 41, 4 (2011): pp. 5-19.

Anonymous. "Leaning lizards make smart moves." *Nature* 475, 7356 (2011): p. 268.

Asakawa, Kazuo and Hideyuki Takagi. "Neural Networks in Japan." *Communications of the ACM* 37, 3 (1994): pp. 106-112.

Asimov, Isaac. "Runaround." Rutgers University. Accessed May 3, 2014. https://www.rci.rutgers.edu/~cfs/472_html/Intro/NYT_Intro/History/Runaround.html.

Barrat, James. Our Final Invention: Artificial Intelligence and the End of the Human Era. New York, NY: St. Martin's Press, 2013.

Benjamin, Medea. *Drone Warfare: Killing by Remote Control*. New York, NY: Verso, 2013.

Bigo, Didier. "After Snowden: Rethinking the Impact of Surveillance." Speech, Ottawa, ON, October 6, 2014.

Boeing. "Defense, Space & Security." Accessed September 9, 2014. http://www.boeing.com/boeing/defense-space/military/scaneagle/.

Brown, Alan S. "Google's Autonomous Car Applies Lessons Learned from Driverless Races." *Mechanical Engineering* 133, 2 (2011): p. 31.

Brown, Alan S. "The Drone Warriors." *Mechanical Engineering* 132, 1 (2010): pp. 22-27.

Byman, Daniel L. "Why Drones Work: The Case for Washington's Weapon of Choice." Brookings Institution. Accessed May 2, 2014. http://www.brookings.edu/research/articles/2013/06/17-drones-obama-weapon-choice-us-counterterrorism-byman.

Cantu, Antonio A. "Counterterrorism Technology and Today's Threat." *Terrorism* 14, 2 (1991): pp. 127-129.

Captain America: The Winter Soldier. 2014. DVD. Los Angeles, CA: Walt Disney Studios Motion Pictures.

Cohn, Carol. "Sex and Death in the Rational World of Defense Intellectuals." *Signs* 12, 4 (1987): pp. 687-718.

Cole, David D. "Drone Strikes: Are They President Obama's Guantanamo?" Speech, Ottawa, ON, November 14, 2013.

Der Derian, James. Virtuous War: Mapping the Military-Industrial-Media-Entertainment-Network. New York, NY: Routledge, 2009.

Descartes, René. Meditations on First Philosophy: With Selections from the Objections and Replies. Cambridge, UK: Cambridge University Press, 1996.

Eckert, Amy E. ""We See Everything": Drone Operators, PTSD, and the Human Experience of War." Paper presented at the Annual Meeting of the International Studies Association West, Pasadena, CA, September 26-27, 2014.

Elysium. 2013. DVD. Culver City, CA: TriStar Pictures.

Ewalt, David M. "The 2013 Forbes Fictional 15." Forbes. Accessed September 23, 2014. http://www.forbes.com/sites/davidewalt/2013/07/31/the-2013-forbes-fictional-15/.

Franklin, Bruce. *War Stars: The Superweapon and the American Imagination*. New York, NY: Oxford University Press, 1988.

Goldman, Emily O. "New Threats, New Identities and New Ways of War: The Sources of Change in National Security Doctrine." *Journal of Strategic Studies* 24, 2 (2001): pp. 43-76.

Goleman, Daniel. Emotional Intelligence: Why it can matter more than IQ. New York, NY: Bantam Book, 1995.

Gregory, Derek. "The everywhere war." *The Geographical Journal* 177, 3 (2011): pp. 238-250.

Grondin, David. "The study of drones as objects of security: Targeted killing as military strategy." In *Research Methods in Critical Security Studies: An Introduction*, edited by Mark B. Salter and Can E. Mutlu, 191-194. New York, NY: Routledge, 2013.

Grondin, David. "The Other Spaces of War: War beyond the Battlefield in the War on Terror." In *War Beyond the Battlefield*, edited by David Grondin, pp. 1-27. New York, NY: Routledge, 2012.

Hambling, David. "Special Forces' Gigapixel Flying Spy Sees All." Wired. Accessed July 9, 2014. http://www.wired.com/2009/02/gigapixel-flyin/.

Hobbes, Thomas. *Leviathan*. Peterborough, ON: Broadview Press, 2002.

Holder, Eric. "Attorney General Eric Holder Speaks at Northwestern University School of Law." Speech, Chicago, IL, March 5, 2012. YouTube. http://www.youtube.com/watch?v=aZX8rtuqMiw.

iRobot. "Defense & Security." Accessed November 22, 2013. http://www.irobot.com/us/learn/defense.aspx.

Johnson, Aaron M. and Sidney Axinn. "The Morality of Autonomous Robots." *Journal of Military Ethics* 12, 2 (2013): pp. 129-141.

Kennedy, Paul. *The Rise and Fall of the Great Powers*. New York, NY: Random House, 1987.

Klaidman, Daniel. *Kill or Capture: The War on Terror and the Soul of the Obama Presidency*. New York, NY: Houghton Mifflin Harcourt, 2012.

Kurzweil, Raymond. *The Singularity is Near: When Humans Transcend Biology*. New York, NY: The Penguin Press, 2005.

Lakoff, George. *The Political Mind: A Cognitive Scientist's Guide to Your Brain and Its Politics*. New York, NY: Penguin Books, 2009.

Lin, Patrick, Keith Abney and George Bekey. "Robot ethics: Mapping the issues for a mechanize world." *Artificial Intelligence* 175 (2011): pp. 942-949.

Lockheed Martin. "Unmanned Systems." Accessed September 9, 2014. http://www.lockheedmartin.ca/us/what-we-do/aerospace-defense/unmanned-systems.html.

Mancilla, Alejandra. "The Bridge of Benevolence: Hutcheson and Mencius." *Dao* 12, 1 (2013): pp. 57-72.

Mandeville, Bernard. *The Fable of the Bees: Or, Private Vices, Publick Benefits*. Indianapolis, IN: Liberty Fund, 1988.

Marinatos, Nanno and Nicolas Wyatt. "Levantine, Egyptian, and Greek Mythological Conceptions of the Beyond." In *A Companion to Greek Mythology*, edited by Ken Dowden and Niall Livingstone, 383-410. Boston, MA: Wiley-Blackwell, 2011.

McCauley, Lee. "AI Armageddon and the Three Laws of Robotics." *Ethics and Information Technology* 9, 2 (2007): pp. 153-164.

McCormick, Ty. "Lethal Autonomy." *Foreign Policy* 204 (2014): pp. 18-19.

Moran, Michael. "Three Laws of Robotics and Surgery." *Journal of Endourology* 22, 8 (2008): pp. 1557-1560.

Moravec, Hans. *Robot: Mere Machine to Transcendent Mind*. New York, NY: Oxford University Press, 1999.

Munakata, Toshinori. "Commercial and Industrial AI." *Communications of the ACM* 37, 3 (1994): pp. 23-25.

Murphy, Robin R. and David D. Woods. "Beyond Asimov: The Three Laws of Responsible Robotics." *IEEE Intelligent Systems* 24, 4 (2009): pp. 14-20.

Neve, Alex. "The Human Cost of Killer Drones." Speech, Ottawa, ON, November 25, 2013.

Nishimoto, Alex. "Google Unveils Autonomous Car Prototype." *Motor Trend* 66, 9 (2014): p. 22.

Northrop Grumman. "Unmanned Systems." Accessed December 7, 2013. http://www.northropgrumman.com/Capabilities/Unmannedsystems/Pages/default.aspx.

Obama, Barack. "President Obama Addresses the Nation on the ISIL Threat." Speech, Washington, DC, September 10, 2014. White House. http://www.whitehouse.gov/photos-and-video/video/2014/09/10/president-obama-addresses-nation-isil-threat#transcript.

Obama, Barack. "President Obama Speaks on the U.S. Counterterrorism Strategy." Speech, Washington, DC, May 23, 2013. White House. http://www.whitehouse.gov/photos-and-video/video/2013/05/23/president-obama-speaks-us-counterterrorism-strategy#transcript.

Obama, Barack. "Barack Obama's Inaugural Address." Speech, Washington, DC, January 20, 2009. *The New York Times*. http://www.nytimes.com/2009/01/20/us/politics/20text-obama.html?pagewanted=all&_r=0.

Paur, Jason. "Autonomous Quadrotors Fly Amazing Formations." Wired. Last modified February 3, 2012. http://www.wired.com/2012/02/autonomous-quadrotors-fly-amazing-formations/.

Plato. *Plato's Republic*. Translated by Benjamin Jowett. The Project Gutenberg. Accessed

August 31, 2014. http://www.gutenberg.org/cache/epub/150/pg150.html.

QinetiQ. "Unmanned Systems." Accessed December 8, 2013. https://www.qinetiq-na.com/products/unmanned-systems/.

Rumelhart, David E., Bernard Widrow and Michael A. Lehr. "The Basic Ideas in Neural Networks." *Communications of the ACM* 37, 3 (1994): pp. 87-92.

Russell, Stuart and Peter Norvig. *Artificial Intelligence: A Modern Approach*. Montreal, QC: Prentice Hall, 2010.

Saurette, Paul and Kelly Gordon. "Arguing Abortion: The New Anti-Abortion Discourse in Canada." *Canadian Journal of Political Science* 46, 1 (2013): pp. 157-185.

Searle, John R. "Consciousness." *Annual Review of Neuroscience* 231, 1 (2000): pp. 557-578.

Searle, John R. "Minds, brains, and programs." *The Behavioral and Brain Sciences* 3 (1980): pp. 417-457.

Shachtman, Noah. "Air Force to Unleash 'Gorgon Stare' on Squirting Insurgents." Wired. Accessed September 22, 2014. http://www.wired.com/2009/02/gorgon-stare/.

Shaw, Ian. "Predator Empire: The Geopolitics of US Drone Warfare." *Geopolitics* 18 (2013): pp. 536-559.

Shaw, Ian. 2012. "From Baseworld to Droneworld." Antipode Foundation. Accessed September 21, 2014. http://antipodefoundation.org/2012/08/14/intervention-from-baseworld-to-droneworld/.

Shelley, Mary Wollstonecraft. *Frankenstein, or, The modern Prometheus*. Cambridge, UK: Cambridge University Press, 1998.

Singer, Peter W. "Gaming the Robot Revolution." Brookings Institution. Accessed April 15, 2014. http://www.brookings.edu/research/opinions/2009/05/22-robots-singer.

Singer, Peter W. "In the Loop? Armed Robots and the Future of War." Brookings Institution. Accessed April 15, 2014. http://www.brookings.edu/research/articles/2009/01/28-robots-singer.

Singer, Peter W. "Robots at War: The New Battlefield." *Wilson Quarterly* 33, 1 (2009): pp. 30-48.

Singer, Peter W. "War of the Machines." *Scientifically American* 303, 1 (2010): pp. 56-63.

Singer, Peter W. Wired for War: The Robotics Revolution and Conflict in the Twenty-first Century. New York, NY: The Penguin Press, 2009.

Suarez, Daniel. "The kill decision shouldn't belong to a robot." TED Talks. June 2013. http://www.ted.com/talks/daniel_suarez_the_kill_decision_shouldn_t_belong_to_a_robot.

Tesla Motors. "Forums." Accessed March 31, 2015. http://my.teslamotors.com/fr_CH/forum/forums/tesla-autonomous-vehicle-tester-program-permits-form-ca-dmv.

Thierer, Adam D. and Clyde Wayne Crews. "Cyber-Surveillance in the Wake of 9/11." CATO Institute. Accessed October 26, 2014. http://www.cato.org/publications/commentary/cybersurveillance-wake-911.

Thrun, Sebastian. "Google's driverless car." TED Talks. March 2011. http://www.ted.com/talks/sebastian_thrun_google_s_driverless_car#t-168732.

Transcendence. 2014. DVD. Burbank, CA: Warner Bros.

Transcendent Man. 2009. DVD. New York, NY: Docurama.

Trhan, Peter. "The Application of Spiking Neural Networks in Autonomous Robot Control." *Computing and Informatics* 29 (2010): pp. 823-847.

Tsodyks, Misha and Charles Gilbert. "Neural networks and perceptual learning." *Nature* 413 (2004): pp. 775-781.

Turing, Alan M. "Chess." In The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial Intelligence, and Artificial Life, edited by B. Jack Copeland, pp. 562-575. Toronto, ON: Oxford University Press, 1953.

Turing, Alan M. "Computing Machinery and Intelligence." In *The Essential Turing: Seminal Writings in Computing, Logic, Philosophy, Artificial Intelligence, and Artificial Life*, edited by B. Jack Copeland, pp. 433-464. Toronto, ON: Oxford University Press, 1950.

Turse, Nick and Tom Engelhardt. *Terminator Planet: The First History of Drone Warfare 2001-2050*. New York, NY: Dispatch Books, 2012.

Van Evera, Stephen. "Offense, Defense, and the Causes of War." *International Security* 22, 4 (1998): pp. 5-43.

Vogel, Ryan J. "Drone Warfare and the Law of Armed Conflict." *Denver Journal of International Law and Policy* 39, 1 (2010): pp. 101-138.

Whittaker, David J. "Problems in definition." In *Terrorists and Terrorism in the Contemporary World*, edited by David J. Whittaker, 1-12. New York, NY: Routledge, 2004.

Widrow, Bernard, David E. Rumelhart and Michael A. Lehr. "Neural Networks: Applications in Industry, Business and Science." *Communications of the ACM* 37, 3 (1994): pp. 93-105.

Williams, Brian Glyn. *Predators: The CIA's Drone War on al Qaeda*. Washington, DC: Potomac Books, 2013.

Wittes, Tamara Cofman. "Around the Halls: Brookings Scholars React to Obama's Speech on ISIS." Brookings Institution. Accessed September 19, 2014. http://www.brookings.edu/blogs/iran-at-saban/posts/2014/09/11-around-the-halls-scholars-react-obamas-isis-speech.

Wood, Ellen Meiksins. "Infinite War." *Historical Materialism* 10, 1 (2002): pp. 7-27.

Wright, Alex. "Automotive Autonomy." *Communications of the ACM* 54, 7 (2011): pp. 16-18.

Yuhas, Alan. "X-37B secret space plane's mission remains mystery outside US military." The Guardian. Accessed October 29, 2014. http://www.theguardian.com/us-news/2014/oct/26/x37b-us-military-secret-space-plane-mission.