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Robots, Androids, and Cyborgs in Warfare: Ethical and Philosophical Issues

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ABSTRACT: Military robots are gradually entering the theater of war in many guises. As the capabilities of these robots move toward increased autonomous operation, a number of difficult ethical and legal issues must be considered, such as appropriate rules of engagement and even notions of robot ethics. In the distant future, as military "artificial beings" that draw on expected advances in cyborg and android technologies are developed, further issues of conscience, consciousness, personhood, and moral responsibility also arise.

KEY WORDS: military robots, robot ethics, rules of engagement, war robots

I. INTRODUCTION

This paper is concerned with exploring the ethical and philosophical issues of employing robots in warfare. For the sake of completeness, androids, cyborgs, and transhuman organisms are also considered, even though the entry of these latter entities into the real world of military operations is still quite remote.*

The Free Merriam-Webster Dictionary defines a robot as "a machine that looks like a human being and performs various complex acts (as walking or talking) of a human being; also: a similar but fictional machine whose lack of capacity for human emotions is often emphasized; an efficient insensitive person who functions automatically; a device that automatically performs complicated often repetitive tasks; a mechanism guided by automatic controls."†

The last two definitions best fit the contemporary robots in use in factories, such as the robots use to paint cars or weld car parts or the lovable Asimo robot made famous by Honda.

Interestingly, by this definition, some complex machines normally known as robots are, in fact, not. One example is surgical robots; these sophisticated machines are, in fact, advanced precision instrument manipulators, and they function entirely under the control of an operating surgeon. They neither function automatically nor do they ordinarily carry out repetitive tasks. However, like military robots, their use entails a number of fascinating legal and ethical issues.‡

*Given that androids and cyborgs do not really exist while robots do, potential ontological issues are raised in such a discussion.

† http://www.merriam-webster.com/dictionary/robot.

‡See for instance Mavroforou A, Michalodimitrakis E, Hatzitheo-Filou C, Giannoukas A. Legal and ethical issues in robotic surgery. Int Angiol. 2010;29(1):75–9.

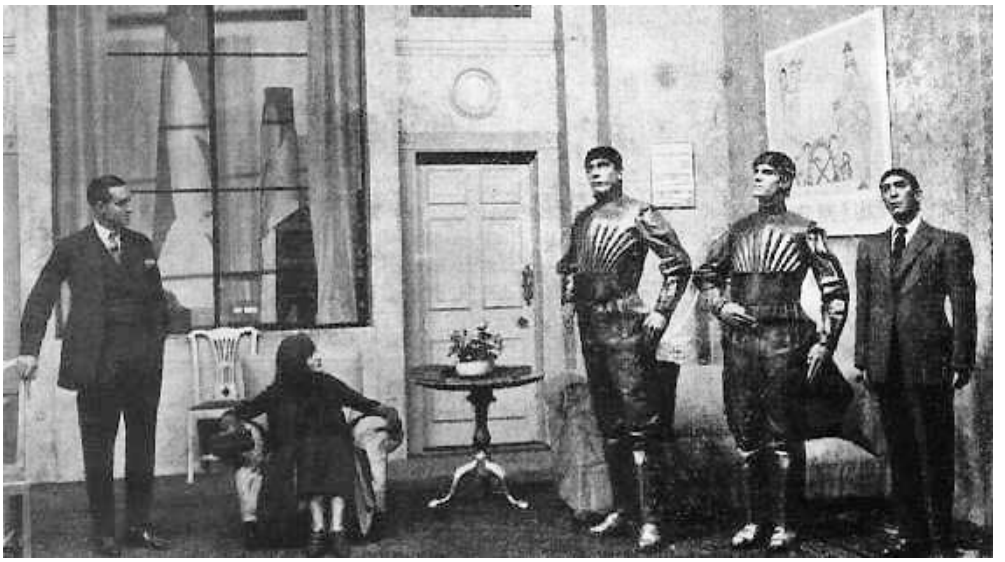

FIG. 1: Scene from Karel Čapek's 1921 play *R.U.R.*, where the term "robot" was first introduced to the world's literary imagination. Wikipedia explains the plot as follows: The play begins in a factory that makes artificial people, made of synthetic organic matter, called "robots." Unlike the modern usage of the term, these creatures are closer to the modern idea of cyborgs or even clones, as they can be mistaken for humans and can think for themselves. They seem happy to work for humans, although that changes, and a hostile robot rebellion leads to the extinction of the human race. *Image Credit:* http://upload.wikimedia.org/wikipedia/commons/8/87/Capek_play.jpg

The term "robot" comes from the 1921 play *R.U.R.* by Karel Čapek, a Czech playwright. (Fig. 1), whereas the term "android" may be defined as an "automaton that is created from biological materials and resembles a human."[§] Any recent cultural reference to androids surely includes Lieutenant Commander Data of *Star Trek: The Next Generation* fame. In this series, Data is a sentient artificial life form with extraordinary cognitive abilities, although he is still unable to feel emotions or understand many human idiosyncrasies.

The term "cyborg," short for cyb(ernetic) + org(anism), has been defined as a human "whose physiological functioning is enhanced by mechanical or electronic devices,"[¶] a definition that would seem to include individuals with any number of medical implants in common clinical use, such as cardiac pacemakers or even contact lenses, but the term is usually taken to involve more advanced enhancements, such as neural prostheses or brain implants.[**] The television series *The Six Million Dollar Man* featured one of the most famous cyborgs, the "bionic man," played by Steve Austin. This 1970s series was based on a novel titled *Cyborg* by Martin Caidin.

For many decades, science fiction writers have written stories about sentient computers, about intelligent robots serving humans as companions, about cyborgs made from a

[§]http://www.thefreedictionary.com/android.
[¶]http://www.thefreedictionary.com/cyborg.
**For an interesting discussion, see Service RF. Bioelectronics. The cyborg era begins. Science. 2013;340 (6137):1162–5.

blend of human and machine parts, and about fully organic humanoids that were not at all human in any traditional sense**.** For instance, Isaac Asimov's famous book of essays *I Robot*[1] (and many of his other writings as well) deals with stories of "positronic" robotic brains and artificial intelligence, usually in a setting of space exploration. Asimov even proposes a form of robot ethics[2]:

- A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- A robot must obey orders given to it by human beings, except where such orders would conflict with the First Law.
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

For many individuals, knowledge of robots and robotics comes from Hollywood. Indeed, robots, androids, and cyborgs are popular characters in a great number of Hollywood productions. Of these, one of the best known of these characters is RoboCop, an advanced human/robot hybrid who initially was supplied with a simple set of moral directives similar to those developed by Asimov but later had the number of moral rules augmented to the point that RoboCop was no longer able to make timely decisions. For example, RoboCop was given additional moral directives pertaining to protection of the environment.

The 2014 edition of RoboCop (I hesitate to call it a remake, since it is so very different from the 1987 original) especially touches upon a number of interesting philosophical issues. Early in the film, the role of emotion in making critical decisions is debated, ultimately leading to the president of OmniCorp (played by Michael Keaton) to redirect his corporate efforts away from developing conventional robotics platforms to instead develop a conscious human-machine hybrid (cyborg) ("Alex," played by Joel Kinnaman) who is capable of emotion. Later we see that the Chief Scientist is able to directly alter the cyborg's emotional life by manipulating dopamine levels in brain tissue, a situation that nicely draws on contemporary research in the neurochemistry of emotion (e.g., see http://www.brainvitge.org/papers/Salimpoor_2011.pdf). In yet another scene in the movie, Alex's combat performance is enhanced by eliminating his free will and replacing it with only the illusion of free will, making us all wonder if, in fact, this is the reality that applies to all of us.

Philosophical issues pertaining to the conduct of science also arise in the 2014 RoboCop film. To what extent do scientists sacrifice their moral integrity by acceding to the wishes of their paymasters (funding agencies)? Subtle (or not so subtle) comparisons with Mary Shelley's *Frankenstein* naturally arise in the film, as does the issue of the militarization of science.

A final philosophical theme in the film concerns the most appropriate means to police the nation and its myriad associated issues, such as the proper conduct of justice and the rights of criminals.

II. MILITARY AND BATTLEFIELD ROBOTS

A number of classifications for robot types can be imagined, such as a classification based on the kinds of movements supported, the kinds of technologies employed, or their intended purposes (domestic, industrial, recreational, medical, military, etc.).

Types of military robots in various stages of development and deployment include domestic and medical robots working in a military environment, transportation robots, rescue robots, intelligence-gathering robots, and armed (killing) robots. Possible divisions of military robots include armed (fighting) versus unarmed robots, terrestrial versus aerial robots, fully autonomous versus semiautonomous versus human-controlled robots, etc.

Of particular interest to many, autonomous robots are now entering the theater of war, at least at the conceptual level. Such robots might seek and destroy enemy fortifications and enemy personnel, either operating on the ground or even from the air, for example, in the form of a small armed helicopter equipped with a video camera and other sensors. The hope among some thinkers is that such "autonomous armed robotic platforms" (as the roboticists like to call such units) will reduce noncombatant casualties and other forms of collateral damage by their unswerving ability to adhere to the "Laws of War" better than even the most well-trained human combatants.

These robots would initially be programmed with a series of specific rules of engagement that might eventually be expanded into a more comprehensive set of guiding principles intended to provide direction for unanticipated novel situations not covered by a more restricted set of military rules of engagement. In the latter situation, however, the question naturally arises as to which set of guiding principles might be adopted for this purpose.

One might imagine a number of possibilities regarding how such robots might operate. For instance, such robots might have rules not to engage in combat with individuals under a specific height (to avoid harming children), individuals waving a white flag, individuals standing with their arms raised high in the air, or individuals lying prone on the ground with their hands clasped together behind their head. Such robots would also be expected to have to have a means to recognize friendly personnel in the theater of operations, perhaps on the basis of their distinctive uniform or (more reliably) on the basis of an implanted RFID chip that, when interrogated, would respond with a code identifying them as friendly combatants.

A rather less sinister version of the battlefield combat robot would be a battlefield medic robot that would assist in the extrication of injured soldiers from the battlefield. Like human medics operating in a theater of war, such robots might even be armed to defend the patient they are rescuing from the battlefield in order to transport them to a nearby field hospital.

Central to all these scenarios, however, is a set of guiding principles. Thinkers such as Arkin[3] have proposed that the Geneva Convention would be a reasonable starting point for such an initiative.

These guiding principles must subsequently be translated into "rules of engagement" pertaining to the theater of operations. Some of these rules are immediately evident to

every soldier: don't shoot at your own soldiers, innocent noncombatants cannot be engaged militarily, surrendering soldiers must be dealt with in a proscribed manner, prisoners of war cannot be tortured nor can they be killed merely to avoid having to care of them, etc.

The process of translating such rules into "robot language" is yet another step. Of course, this problem is far from solved in the field of artificial intelligence, especially because judgment is inevitably required to match the applicable engagement rules to the specific military situation. And programming judgment into a robot's computer is no easy task; in fact, some thinkers hold that complex judgment is a uniquely human capability.[††]

Presumably, however, proponents of armed military robots would start off with a relatively simple problem first, such as substituting armed sentry robots in place of land mines (technically, anti-personnel mines) in a "no humans allowed" demilitarized zone.

Such an approach, for example, would permit the United States to be a signatory to treaties regarding the nonuse of military land mines[‡‡] and offers the additional advantage of being able (in principle) to distinguish friend from foe as well as the ability of the robots to be automatically disabled should a communications link failure occur (a safety feature not possible with conventional land mines).

Of interest, plans to deploy sentry robots at the North–South Korean border (where no people are allowed) are in development now.[§§] Known as the Samsung Techwin SGR-1 and equipped with high-resolution cameras, laser range finders and advanced thermal imaging sensors capable of detecting intruders from North Korea, these military robots, like today's drones, make it very easy (and safe) to kill from afar. And just like today's drones, the plan is that these armed robots, capable of both launching grenades as well as shooting large-caliber rounds, will require intervention from a human operating in a remote bunker.

Still, the possibility of fully autonomous operation is no doubt a sophisticated technical challenge many military engineers would love to tackle, just as the many scientists and engineers were similarly challenged during the World War II Manhattan Project to develop the atomic bomb.[¶¶]

[††]For a comprehensive treatment of this very interesting technical/philosophical problem see Joseph Weizenbaum's profoundly influential book *Computer Power and Human Reason: From Judgment To Calculation* (San Francisco: W. H. Freeman, 1976; ISBN 0-7167-0463-3). *From Wikipedia:* Weizenbaum argues that while artificial intelligence may be possible, we should never allow computers to make important decisions because computers will always lack human qualities such as compassion and wisdom. Weizenbaum makes the crucial distinction between deciding and choosing. Deciding is a computational activity, something that can ultimately be programmed. It is the capacity to choose that ultimately makes us human. Choice, however, is the product of judgment, not calculation. Comprehensive human judgment is able to include non-mathematical factors such as emotions.

[‡‡]The United States is not a signatory to the *Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction*, better known as the *Ottawa Treaty*.

[§§]For more details, visit http://www.engadget.com/2010/07/13/south-korea-enlists-armed-sentry-robots-to-patrol-dmz/ To see a promotional video for this product, which uses heuristics and computer vision to identify and target human shapes, visit http://www.youtube.com/watch?v=v5YftEAbmMQ.

[¶¶]Many of the scientists and engineers working on the atomic bomb were morally conflicted. For an interesting account see *The Manhattan Project: The Birth of the Atomic Bomb in the Words of Its Creators, Eyewitnesses, and Historians* edited by Cynthia C. Kelly (Black Dog & Leventhal Publishers, 2009; ISBN 1579128084).

III. ETHICAL ISSUES

A particularly important question concerns the ethics of providing autonomous military robots with the authority to kill enemy combatants, subject (of course) to clear rules of engagement. This presupposes an affirmative answer to the related question: "Can an autonomous military robot be designed to strictly comply with the laws of war and related ethical edicts?" This latter question straddles the fields of robotics, artificial intelligence, and practical ethics, and while the question is at the center of active academic and military research, it will be some time before a clear answer becomes available.

Today, we are familiar with the current use of military robot drones remotely piloted by soldiers, these can only fire rounds under human control, they are not at all autonomous. But one can certainly imagine a number of situations in which full autonomy might be desirable, as in the case of a robotic submarine on a reconnaissance mission encountering enemy warships that are eligible for military engagement. Regardless, some experts envision military robots serving in a role more akin to the relationship working dogs have with their soldier masters: one of strict obedience to their human controllers.

Additionally, just as human military commanders in the field must sometimes contact headquarters for orders, military robots in some situations also need to obtain authorization to perform lethal actions; one imagines that in most cases military robots would be given no more authority than human commanders in the field.

Notwithstanding these practical points, it is interesting to consider whether a robot might ever be endowed with the judgment comparable to that of, for example, a corporal in assessing the legal and moral aspects of considered military actions. Given that humans already make errors of judgment, robots might someday be better than humans, given that they never get tired, or angry, or drunk—they just reliably follow rules. And arguably, if the rules are sufficiently sophisticated, might not such robots actually surpass humans in moral and legal judgment? One might even speculate further: Could a sufficiently sophisticated robot have a conscience? Presumably, this last question presupposes that robots might someday be developed with consciousness, introducing us to questions of moral standing, personhood, and moral responsibility (*vide infra*).

Members of the *Campaign to Stop Killer Robots*, an international coalition of nonprofits maintaining a web presence at http://www.stopkillerrobots.org/, promote a ban on fully autonomous weapons, arguing that in cases when a human life is at stake, such as with military conflicts, self-defense, or capital punishment, human judgment is indispensable. They argue that allowing life and death decisions to be made by robots "crosses a fundamental moral line" and that autonomous robots necessarily lack the judgment and contextual understanding needed to make complex moral choices. As a result, they argue, fully autonomous weapons cannot not meet the requirements of the laws of war.

Members of the *Campaign to Stop Killer Robots* offer an additional concern: they argue that the use of fully autonomous weapons "would create an accountability gap" regarding who would be legally and morally responsible for a robot's actions. Would it be the supervising military commander, the manufacturer, or perhaps even the robot

itself? Without accountability, they argue, involved parties "would have less incentive to ensure robots did not endanger civilians," while victims would be left without justice for any harm they might have experienced from robots "gone wild."

However, some experts argue that it is only a matter of time before some autonomous robot operations become more reliable than military operations using mere humans, at least in specialized settings. Thus, while many thinkers think that there are moral, and ethical reasons that the authority to kill people should never be delegated to machines, should their operation become substantially more reliable than human-based operations, such a position may merit reevaluation. In particular, one wonders if advanced "artificial beings" might fit the bill. We explore this intriguing issue next.

IV. ARTIFICIAL BEINGS

As noted earlier, for many decades science fiction writers have written stories about sentient computers, about intelligent robots serving humans as companions, about cyborgs made from a blend of human and machine parts, and about fully organic humanoids who were not at all human in any traditional sense. As today's scientists draw on developments in computer technology, robotics, artificial intelligence, molecular neuroscience, nanotechnology, and other emerging fields, it is reasonable to expect that such notions will gradually move from science fiction to scientific (and even commercial) reality.

One ongoing scientific effort on the fringes of science and engineering is to attempt to create sentient artificial beings embedded with consciousness (and perhaps even a conscience). One particularly interesting philosophical issue in this context is whether a sufficiently complex machine might ever become self-aware. Most people agree that the "seat" of consciousness lies in the brain. And virtually all neuroscientists attempt to explain the workings of the brain as if the brain were a machine, albeit very possibly the most complex machine in existence. But if the brain is just a conscious machine governed by physical laws, could it not be possible, at least in principle, to construct a computer that is conscious just like a biological brain? Wooldridge[4] expresses this point as follows:

> If there is any kind of definite cause-and-effect relationship between the lifelong sequence of electrical pulse leaving the brain and the lifelong sequence of electrical pulse entering the brain, it can be precisely implemented in a switching network of the type that is known to underlie the design of all electronic digital computers and that at least appears to underlie the design of the brain.(p. 92)

Later Wooldridge goes on to conclude that:

> ... [A]ll intelligence whether of computer or brain, is a natural consequence of the powerful symbol-manipulating capabilities of complex switching networks and that therefore the ordinary laws of the physical scientist are adequate to account for all aspects of what we consider to be intelligent behavior.(p. 128)

Arguably, the question or whether machines can ever be conscious may be related to the question of whether consciousness in the brain is active or passive. A passive consciousness is one which, while possibly arising as a natural consequence of a particular structural

organization, nevertheless does not causally influence any material entities (e.g., neurons). Rather, it is a passive bystander, a result, rather than a cause. In contrast, an active consciousness is one that can actively "will" events, one that can be an initial cause in a sequence of neuronal events. The active consciousness position views consciousness as an actual causal agent, one that allows for free will.

Most neuroscientists adopt the position that consciousness is passive in nature, implicitly allowing for the scientific investigation of behavior and intelligence without any consideration of consciousness. Simply put, while physical processes in the brain are held to exert considerable influence over consciousness, the passive consciousness position holds that consciousness does not exercise influence over physical activities within the brain. This is related to the position of "Strong AI," discussed next. Free will is not held to exist in such a setting.

Regardless of this issue, since the physical basis of consciousness is not yet understood except possibly in the broadest of strokes, many scientists regard the goal of producing an artificial sentient being as unachievable in the near future, if at all. Indeed, some philosophers such as McGinn[5] regard the problem of consciousness to be too intractable for the best of ordinary human brains to solve, just as a cat surely does not have the cognitive capacity to solve even the simplest of quadratic equations. Other thinkers, like Roger Penrose, are cautiously optimistic. In his book *Shadows of the Mind,*[6] Penrose outlines four potential positions about the possible neurocomputational basis of consciousness:

- **Viewpoint A:** All thinking is computation. Feelings of conscious awareness are evoked merely by the carrying out of appropriate computations on the appropriate physical substrate. This is known as the "Strong Artificial Intelligence (AI)" position.
- **Viewpoint B:** Awareness is a feature of the brain's physical action. Whereas any physical action can be simulated computationally, computational simulation cannot by itself evoke awareness. This is known as the "Weak AI" (Soft AI) position.
- **Viewpoint C:** Appropriate physical action of the brain evokes awareness but this physical action cannot be properly simulated computationally. This is Penrose's personal position.
- **Viewpoint D:** Awareness cannot be explained by physical, computational, or any other scientific terms. This is similar to McGinn's "mysterian" position, although McGinn readily acknowledges that minds greater in capability than those possessed by humankind might, at least in principle, eventually be able to come to understand consciousness and self-awareness in purely scientific terms.(p. 12)

Penrose argues that "we must look beyond the reaches of known sciences if we are ever to find any kind of explanation of the phenomenon of consciousness."(p. 16) According to Penrose, the problem of conscious awareness is a scientific one (not mystical, as in Viewpoint D), even if the appropriate science is not yet at hand. He also allows for graduations between A, B, C, and D. In his earlier book *The Emperor's New Mind*,[7] Penrose articulates a position opposing to strong AI by arguing that "there must be an essentially

non-algorithmic ingredient in the action of consciousness" (p. 407) and he has even speculated that the microtubular structures present in neurons may be important in understanding the physical basis for consciousness.

If we were able to produce a conscious artificial being, what tests might we deploy to establish that the new entity is indeed self-aware? This question is a variant of the well-known "Other Minds Problem," which is briefly summarized as follows: Given that I can only observe the behavior of others and am not granted privileged access to their mind to directly experience their mental events, how can I truly know that any other beings have minds? The problem here is that mere observation of behavior, no matter how sophisticated and complex, does not allow one to infer with complete certainty that there are mental events associated with this behavior. Some skeptics argue, for instance, that it may actually be the case that all the other people in the universe are in fact unconscious biological automata ("zombies" in the technical parlance used by a number of neurophilosophers). Arguing in this manner that that there exist no minds other than one's own and that attempting to establish the existence of other minds is futile is a position known as "solipsism."

In the field of AI, one approach occasionally offered to this problem is the "Turing Test,"[8] which may explained as informally follows. A human judge converses with one human and one computer (or other machine), each of which does its best to appear human. The conversation can transpire via text communication (e.g., via SMS messaging) or by audio, and all participants are isolated from one another to prevent visual cues. If the judge cannot tell the machine from the human, the machine is said to have passed the Turing Test of machine intelligence.

It is worth emphasizing that Turing offered his test as an operational means to establish whether a machine could "think." Specifically, his introductory remarks began as follows:

> I propose to consider the question, "Can machines think?" This should begin with definitions of the meaning of the terms "machine" and "think." The definitions might be framed so as to reflect so far as possible the normal use of the words, but this attitude is dangerous. If the meaning of the words "machine" and "think" are to be found by examining how they are commonly used it is difficult to escape the conclusion that the meaning and the answer to the question, "Can machines think?" is to be sought in a statistical survey such as a Gallup poll. But this is absurd. Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words.[8]

A number of criticisms of the Turing Test have been raised over time. For instance, it is sometimes said to be more a test of a machine's ability to imitate a human being than a test of thinking ability. Another criticism is that even if the Turing Test is a test for thinking, this does not necessarily imply that it is a test for consciousness. For a full discussion of this topic the interested reader is given an excellent review by French.[9]

An interesting philosophical question concerns the extent to which sentient artificial beings are deserving of moral standing and personhood. Although there is no means to establish with absolute certainty that any putative sentient artificial being is in fact sentient (per the "Other Minds Problem"), it is nonetheless reasonable to consider the issues of moral standing and personhood in such beings. After all, the "Other Minds Problem" is also applicable to everyday humans and to many advanced species of animals, yet this

fact is evidently not an impediment to our considering the issues of moral standing and personhood in these beings.

Recall that the "moral standing" of a being determines the degree to which its welfare and well-being must be given ethical consideration. That is, a being merits moral standing if we believe that it makes a difference, morally speaking, how that being is treated, and that we should take into account that individual's interests for the individual's own sake and not merely for our benefit or the benefit of someone else.

What then should be our approach to moral standing for artificial beings? I propose that the Hughes classification of consciousness and rights provided in his book *Citizen Cyborg: Why Democratic Societies Must Respond to the Redesigned Human of the Future*[10] be adapted for this purpose. Simply put, any artificial being (robot, cyborg, humanoid, computer, etc.) would be classified with regard to consciousness and rights based its behavior and its properties just as humans, animals, embryos, and plants are classified in the Hughes classification. I suspect, however, that it will be quite some time before this issue arises in the real world of practical ethics.

A great philosophical question that continues today asks the question whether any beings other than humans merit moral standing. One commonly held position is that only beings with the actual or potential capacity to reason merit moral standing. Another commonly held position is that any beings that have the capacity to suffer ought to have some form of moral standing afforded to them that should at least make gratuitous cruelty against them to be immoral.

V. PERSONHOOD AND MORAL RESPONSIBILITY

Recall that the recognition of an entity as being a person is known as **personhood**. Philosophical literature offers many possible definitions as to what constitutes a "person," usually focusing on criteria such as self-awareness, a sense of self that is maintained through time, or similar criteria. In his famous work *An Essay Concerning Human Understanding,* the English philosopher John Locke defined a person as "a thinking intelligent Being, that has reason and reflection, and can consider itself as itself, the same thinking thing in different times and places; which it does only by that consciousness, which is inseparable from thinking, and as it seems to me essential to it." Hughes[10] has extended the work of Locke and others to consider a spectrum of rights in organisms varying in the extent to which they exhibit consciousness.

To many philosophers, drawing on the above Lockean criteria for personhood, persons may not necessarily be humans (some animals may merit personhood), whereas some human entities such as embryos, fetuses or severely brain damaged adult patients may not qualify for personhood. Under such a scheme, some of the great apes may qualify for personhood, while some people afflicted with severe dementia from Alzheimer's disease or traumatic brain injury may not.

Closely related to the discourse on what constitutes personhood are issues of moral standing, individual rights and ethical responsibility. For instance, it is commonly held that all individuals meeting personhood criteria are deserving of at least some individual

rights and that only persons (and not, for instance, lower animals) are expected to be ethically responsible for their actions. Another ongoing philosophical debate concerns whether people (who may or may not be persons) deserve greater rights and higher moral standing than non-people; the rights of nonhuman animals are an example.[11,12]

These issues are more than theoretical. For instance, it is now generally accepted that many Great Apes can learn to communicate with humans using signs and symbols (e.g., using lexigrams or American Sign Language), although the exact extent of their capabilities still remains a matter of ongoing debate among anthropologists and primatologists. Naturally, the outcome of such debates will play a role in yet another military ethics issue: What are the ethical issues in using animals in warfare?***

VI. CONCLUSION

As the capabilities of military robots move toward increased autonomous operation, a number of ethical and legal issues must be debated.[13,14] Should military "artificial beings" that draw on expected advances in cyborg and android technologies become developed, further issues of conscience, consciousness, personhood and moral responsibility will also arise. War will never be the same.

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***While this interesting issue is beyond the scope of the present paper, it is interesting to note that pigeons were used to carry messages in World War I while in World War II dogs were trained to detonate explosive under tanks. Today we use dolphins to seek out sea mines and dogs to sniff for bombs. The CIA even tried to make a "cybercat" with implanted brain electrodes to allow remote feline control. (http://en.wikipedia.org/wiki/Acoustic_Kitty).