Ethical Implications of Military Robotics

Dr. P.W. Singer

The 2009 William C. Stutt Ethics Lecture

sponsored by
The Vice Admiral James B. Stockdale Center for Ethical Leadership
U.S. Naval Academy

Alumni Hall
March 25, 2009

Dr. P.W. Singer

Peter Warren Singer is Senior Fellow and Director of the Twenty-first Century Defense Initiative at the Brookings Institution. He is the youngest scholar named Senior Fellow in Brookings's 90-year history. In 2005, CNN named him to their "New Guard" List of the Next Generation of Newsmakers. In his personal capacity, Singer served as coordinator of the Obama-08 campaign's defense policy task force.

Dr. Singer is considered one of the world's leading experts on changes in twenty-first century warfare. He has written for the full range of major media and journals, including the *Boston Globe*, *L.A. Times*, *New York Times*, *Washington Post*, *Foreign Affairs*, *Current History*, *Survival*, *International Security*, *Parameters*, *Weltpolitik*, and the *World Policy Journal*. He has been quoted in every major U.S. newspaper and news magazine and delivered talks at venues ranging from the U.S. Congress to more than 40 universities around the world. He has provided commentary on military affairs for nearly every major TV and radio outlet, including *Nightline*, Al Jazeera, BBC, *60 Minutes*, CNN, Fox, NPR, and the *Today Show*. He is also a founder and organizer of the U.S.-Islamic World Forum, a global conference that brings together leaders from across the United States and the Muslim world (www.us-islamicworldforum. org).

His first book *Corporate Warriors: The Rise of the Privatized Military Industry* (Cornell University Press, 2003) pioneered the study of the new industry of private companies providing military services for hire, an issue that soon became important with the use and abuse of these companies in Iraq. It is now in the assigned texts at schools

ranging from Yale Law School to the Army War College. Singer continues to serve as a resource on the private military issue to the U.S. Congress, U.S. Department of Defense, CIA, and the European Union.

Dr. Singer's next book, *Children at War* (Pantheon, 2005) explored the rise of another new force in modern warfare, child soldier groups. It was the first book to comprehensively explore the compelling and tragic rise of child soldier groups and was recognized by the 2006 Robert F. Kennedy Memorial Book of the Year Award. His current book, *Wired for War* (Penguin, 2009) looks at the implications of robotics and other new technologies for war, politics, ethics, and law in the twenty-first century. It made the *New York Times* non-fiction bestseller list in its first week of release.

Prior to his current position, Dr. Singer was the founding Director of the Project on U.S. Policy Toward the Islamic World in the Saban Center at Brookings. He has also worked for the Belfer Center for Science and International Affairs at Harvard University, the Balkans Task Force in the U.S. Department of Defense, and the International Peace Academy. Singer received his Ph.D. in Government from Harvard University and a BA from the Woodrow Wilson School of Public and International Affairs at Princeton University.

Ethical Implications of Military Robotics

Welcome and Introduction
Colonel Arthur Athens, USMCR (Ret.)
Director, VADM James B. Stockdale Center
for Ethical Leadership

•

Lecture
Dr. P.W. Singer

•

Questions and Answers

This is an edited, abridged version of the original lecture transcript.

Welcome and Introduction

Colonel Athens

My name is Colonel Art Athens, and I have the honor of serving as the Director of the Vice Admiral Stockdale Center for Ethical Leadership here at the Naval Academy. I'd like to welcome you to the William C. Stutt Ethics Speaker Series. Mr. Stutt is a 1949 graduate of the Academy. He served five years in the Navy, joined the investment firm Goldman Sachs, and eventually rose to the position of limited partner. He and his wife donated money to allow this series to occur, and it began in 2005. Their intent was to establish a series that allowed third-class midshipmen to think deeply about ethics, character, and leadership. Tonight we have an opportunity to fulfill Mr. Stutt's vision as we listen, reflect, and take action.

Our guest speaker tonight is Dr. Peter Singer, a senior fellow and Director of the Twenty-first Century Defense Initiative at the Brookings Institute. He's the youngest scholar named as a senior fellow in Brookings' 90-year history. Dr. Singer received his BA from Princeton and a Ph.D. in government from Harvard. He is considered to be one of the world's leading experts on changes in twenty-first century warfare. He has written for the nation's most prestigious newspapers and journals, including the *Boston Globe*, *L.A. Times*, *New York Times*, *Washington Post*, *Foreign Affairs*, *Current History*, and *Parameters*. He has also provided commentary for *Nightline*, BBC, *60 Minutes*, CNN, Fox, NPR, Al Jazeera, and the *Today* show. Perhaps he's most famous, though, because he showed up on the Jon Stewart *Daily Show*. Jon Stewart interviewed him and was thrilled with the work that he has done.

Dr. Singer's previous thought-provoking and influential books were *Corporate Warriors: The Rise of the Privatized Military Industry* and *Children at War*, which is a book that explores child soldier groups. His most recent book, which came out this year, is called *Wired for War*, a look at robotics and other new technologies and their im-

plications for war, politics, ethics, and law. *Wired for War* made the *New York Times* nonfiction bestseller list in its first week of release.

We are very fortunate to have Dr. Singer with us tonight. Please give him a warm welcome.

Lecture

Thank you for that kind introduction. It's a real honor for me to be here tonight in this series that honors a great American. It's a double honor for me in that another great American, my grandfather, was on the faculty here right after World War II. My mother was actually born on the grounds, so for many reasons, it's very special to get an invitation here.

What I'd like to do is open with a scene of war from the book. You have to imagine yourself in Iraq, and hidden along the road in front of you is what looks like a piece of trash. It's actually an IED, an improvised explosive device that a bad insurgent has hidden with great care. Now by 2006, there were more than 2,500 of these IED attacks in Iraq every single month, and they were the leading cause of casualties among both the American troops as well as Iraqi civilians.

Now the team that's hunting for this IED is an EOD team—explosive ordnance disposal—and these teams are the pointy end of the spear in the effort to stop these roadside bombings. In a typical tour in Iraq, an EOD team would go out on more than 600 bomb calls. That is, they'll defuse about two bombs every single day. But the number that's probably the better indicator of their value to the war effort is $50,000—the amount of the bounty insurgents offer for the head of an EOD soldier.

Unfortunately, this particular bomb call did not end well. By the time the soldier got close enough to see the telltale wires coming out from that IED, it exploded. Now depending on how much explosive is packed into one of these roadside bombs, you have to be as far away as 50 yards to escape death or injury from the fragments coming at you at bullet speed. In fact, even if you're not hit, just the sheer force of the blast can break your limbs. That soldier, though, had been right on top of that IED, and so when the dust cleared and the rest of the team advanced, they found little left.

That night, the unit's commander sat down to do his duty, writing a letter back to the United States that described how hard the loss had been on that unit, how they all felt they had lost their greatest soldier, and they felt they had lost a soldier that had saved the others' lives time and again. The commander apologized for not being able to bring that soldier home, back to the United States. But then the commander talked about the silver lining in this loss. This is what that officer wrote: "At least when a robot dies, you don't have to write a letter to its mother."

That scene may have sounded like science fiction, but it was actual battlefield reality. That soldier that was killed was a 42-pound robot called a PackBot. That letter didn't go back to some farmhouse in Iowa as happens in all the old war movies. It actually went to a factory right outside Boston called "iRobot." That is, it is named after the fictional Isaac Asimov novel and the not-so-great Will Smith movie in which robots start out with mundane chores and then move on to making decisions with life-or-death consequences.

The images here [from a PowerPoint presentation] are simply to give you a sense of the reality of these technologies. Every picture or video that you see here is of a system that is already operating in Afghanistan and Iraq right now or already at the prototype stage. Nothing that you see is science fiction. Nothing is powered by Vulcan technology. Nothing comes from the world of fantasy. Nothing is powered by teenage wizard hormones. This is the real deal.

Something big is going on in the history of war, maybe even in the history of humanity itself. The U.S. military went into Iraq with just a handful of drones or UAVs, unmanned aerial vehicles. We now have over 7,000 of these in the U.S. military inventory. We went into Iraq with zero unmanned ground vehicles, ground robotics. We now have over 12,000 in the U.S. military inventory, and these are just the first generation. They are the Wright Brothers' flyers. They are the Model T Fords compared to what's coming. The killer "app," or killer application, doesn't just describe what iPods have done with the music industry. They take on an entirely

new meaning when you're talking about arming these systems with everything from machine guns to Hellfire missiles.

One Air Force three-star general that I spoke with said that we'll soon be talking about "future conflicts involving tens of thousands of robots." But these numbers matter in another way, because we aren't going to be talking about tens of thousands of these robots. We're going to be talking about tens of thousands of the prototype robots, of tomorrow's robots. One of the things you have when you're talking about technology is Moore's Law, the idea that you can pack more and more computing power into our microchips, such that their power basically doubles every two years. Moore's Law is the reason, for example, that if you gave your mom a Valentine's Day card that opened up and played a little song, that one card had more computing power than the entire U.S. Navy did back in 1960.

Carrying forward, that means that our systems, these systems that you see here, will be a billion times more powerful than today within 25 years. I'm not saying a billion in sort of an amorphous, meaningless, Austin-Powers' one billion. I mean, literally take the power of those systems and multiply them times a 1 with 9 zeros behind it. What that means is that the kind of things people used to talk about only at science fiction conventions like Comic-Con now need to be talked about by people like us, need to be talked about by people in the halls of power, need to be talked about in the Pentagon. We are experiencing a robots revolution.

When I say robots revolution, I don't mean that you need to watch out for the Governor of California showing up at your door a là the Terminator or something like that. We're talking about a revolution in war and technology. Every so often, a new technology comes along that rewrites the rules of the game, forces us to ask new questions about not only what's possible but also what's proper. In war, these are things like the atomic bomb.

There is a difference, though, with robotics, because every previous revolutionary technology changed the "how" of war. It was a sys-

tem that had a dramatically bigger boom like the atomic bomb, a system that shot dramatically faster like the machine gun, a system that allowed you to shoot farther like the longbow or the gunpowder revolution. That's definitely happening with robotics, but these technologies are also changing not just the "how" but the "who." That is, they reshape warriors' experience and the very identity of warriors themselves. Another way of putting it is that humankind is starting to lose its 5,000-year-old monopoly on the fighting of wars.

I thought that was extremely significant, so I set out a few years ago to write a book about it. I basically interviewed anyone and everyone connected to both war and robotics today. So I interviewed scientists working on the systems, everywhere from Darfur to the Office of Naval Research. I interviewed the science fiction authors who inspired them, many of whom are actually quietly consulting now for the Pentagon. I interviewed those in service, asking everything from what it's like to be a 19 year-old drone pilot to what almost every four-star general, every combatant commander, thinks about these systems and what it's like to lead them. I did interviews on the civilian politician side, for example, with every single service secretary, SEC NAV, SEC ARMY, et cetera. I interviewed the opposite side. What do Iraqi insurgents think about our systems? What do they think about us using these systems? What do newspaper editors in places like Pakistan or Lebanon think about this? I also wanted to get a sense of the ethics and the laws-of-war questions, so I interviewed people from places like the International Red Cross or Human Rights Watch.

The stories that came out of this are fascinating. They're scary but interesting. But they also shine a light on some of the dilemmas and questions that we are soon going to face in our politics, in our law, in our ethics—you name it. So what I'd like to do is basically flesh out a few of these dilemmas for you. The first is that the future of war is not just going to be an American one with these technologies. There is a rule in both technology and war. There is no such thing as a permanent first mover advantage.

So, quick show of hands: How many of you use Commodore 64 computers right now? How many of you played Atari video games on your Atari machine? Those were dominant players. They're not dominant anymore. The same thing goes in terms of war. The British invented the tank; the Germans figured out how to use the tank better. The United States is definitely ahead in military robotics right now, but there are 43 other countries working on military robotics. They're countries like Russia, China, Pakistan, and Iran. We actually just shot down an Iranian drone over Iraq last week.

We have to ask ourselves: where does the state of the American manufacturing economy and the state of science and mathematics in our schools take us in this revolution? Or another way of phrasing it is: what does it mean to be deploying more and more soldiers whose hardware is made in China and whose software is written in India?

Just as software has gone open source, the same thing is happening in warfare. That is, these technologies are not like an aircraft carrier or atomic bomb, where you need a massive industrial structure to put them together. A lot of them use commercial, off-the-shelf technology. Some of it is even do-it-yourself. For about $1,000, you can build your own version of the Raven drone.

What that means is that we have a flattening effect when it comes to war and technology. It's not just the big boys that can use and even improve upon these systems. For example, when Israel went to war with Hezbollah, it didn't go to war against the military of a fellow nation state. That paramilitary/terrorist group flew four drones back at Israel.

In another example from the book, a group of college kids at Swarthmore wanted to do something about the genocide in Darfur, so they held a fund-raiser. It went a lot better than they planned. They actually ended up raising about a half million dollars, with which this group of college kids entered into negotiations with a private military company for the rental of drones to deploy to Sudan. They held the negotiations out of their dorm room.

What we have here is a cross between robotics and the potential of nonstate actors, and this can lead to some dark things. There are two trends that are going to come out of this. One is that these systems reinforce the power of individuals and small groups against the state. The second is that they eliminate the need to recruit suicide bombers. That is, you don't have to promise a robot that it's going to be received by 70 virgins in heaven to persuade it to blow itself up. And so the future of terrorism may be this cross between Al Qaeda 2.0 and the next-generation version of Timothy McVeigh, both made far more lethal by these technologies.

These ripple effects of war go out into our own politics. A former Assistant Secretary of Defense who served for Ronald Reagan put it really well, and this is his quote: "I like these systems because they save lives. But I also worry about more marketization of war, more shock-and-awe talk to defray discussion of the costs. People are more likely to support the use of force if they view it as costless."

So for me, robots seem to take certain trends that are active in our body politic right now and bring them to their final logical ending point. You can think about it this way: as you all know, we don't have a draft anymore. We don't declare war anymore. We don't buy war bonds anymore, pay higher taxes for war anymore, and now we have a trend that takes more and more of those who would go into harm's way and replaces them with machines. The political consequences of this may be that we are taking the bars to war in our society that are already lowering and dropping them to the ground.

There is a real-world example of this right now. We have carried out more than 50 arms strikes into Pakistan over the last year and a half. We carried out the equivalent of the opening week of the Kosovo War, but we don't talk about it. We don't talk about it in our media or politics because it's been done via drones.

The future of war is also going to be a YouTube war. That is, the systems don't just merely remove the human from risk. They record everything that they see, so they don't just delink the public,

they reshape the relationship of war. There are already several thousand video clips of combat footage from Iraq and Afghanistan up online right now on sites like YouTube, some of it released officially, some of it released unofficially. Now this can arguably be a good thing. You're building links between the home front and the war front that didn't exist before. But we need to remember that these technologies, although they may sound like science fiction, are playing out in our very real, very human, very strange world. So for some people, the ability to download a video clip of combat is turning war into a form of entertainment.

The folks deployed in the field have a name for it. They call it "war porn" or "predator porn." I received a typical example with a title line that says, "Watch this." Now we all sometimes get e-mails like that with a little clip attached. Typically, it may be someone screwing up on *American Idol* or a video clip of a nerdy kid dancing in his basement, or something like that. In this case, the "watch this" was of a predator drone strike. A Hellfire missile drops, goes in, and hits the target, followed by an explosion and bodies tossed into the air. It was set to music, the pop song "I Just Want to Fly" by the band Sugar Ray.

What we have is the ability to watch war but experience less when it comes to war, and these clips can be very seductive. It's easy to forget that the violence is real. It's easy to forget that not everyone is fighting from afar, and it also has a warping effect. It's like the difference between watching an NBA game, a professional basketball game on TV, where the players are these little, tiny figures on the screen, versus what it's like to watch that NBA game in person, where you see what someone who's seven feet tall really does look like, versus the experience of playing in that game yourself and knowing what it's like to be dunked on by K.G. [Kevin Garrett]. But the thing is, you're not even watching the whole game. You're watching the highlight reel. You're watching the ESPN "Sports Center" version of the war, so all the context, all the training, all the strategy—it all just becomes slam-dunks and smart bombs.

The irony of all this is that while the future of war may involve more and more machines, war is still driven by our human failings. These ripple effects are still about our human psychology and our human politics. We have a policy example of this right now. What are robots' impact on our very real, very human war of ideas that we're fighting against radical groups around the world? That is, what is the message we think we are sending when we use unmanned systems versus what is the message that's being received half a world away? I tried to find the answer to this question, and one of the people that I interviewed put it well in terms of our perceptions. He's a very senior Bush Administration official, and he said how our unmanning of war "plays to our strength. The thing that scares people is our technology."

Well, what about the message that is received? I asked the leading newspaper editor of Lebanon, and there was actually a drone flying above him at the time. This is his quote: "It's just another sign of the cold-hearted, cruel Israelis and Americans who are also cowards, because they send out machines to fight us. They don't want to fight us like real men; they're afraid to fight, so we just have to kill a few of their soldiers to defeat them."

Basically, we have a disconnect between the message sent in the war of ideas versus the message received, or as one Pentagon analyst put it, "The optics of this look really freaky in battle. It makes us look like the evil empire from 'Star Wars' and the other side look like the Rebel Alliance."

The future of war, though, involves a new experience of war, a new type of war, changing the meaning of going to war itself. Going to war, that phrase, has meant the same thing for 5,000 years, whether you were talking about the ancient Greeks going to war against Troy or my grandfather going to war in the Pacific against the Imperial Japanese fleet. It meant that you were going to a place where there was such danger that your family might never see you again. That's what going to war has always meant.

But compare that to the experience of a Predator drone pilot. I asked on what it was like to fight insurgents in Iraq while based in Nevada. He said, "You are going to war for 12 hours, shooting weapons at targets, directing kills on enemy combatants, and then you get in the car and you drive home. And within 20 minutes, you're sitting at the dinner table talking to your kids about their homework." The psychological disconnect of being at war and then immediately at home is not easy, and we're discovering in fact that these units of remote warriors actually have higher levels of combat stress and PTSD than many of the units physically deployed to Iraq and Afghanistan.

It's also affecting the experience of killing. "It's like a video game" is how one young pilot described what it was like to take out enemy troops. As anyone who has played "Grand Theft Auto" knows, there are things that we would do in the virtual world that maybe we wouldn't do in the real world.

Much of what you're hearing here is that there are always two sides to every revolution. So for example, while Moore's Law is happening with these systems, Murphy's Law isn't going away. The fog of war isn't being lifted. The enemy still has a vote. Mistakes still happen. Most importantly, we may be getting incredible capabilities, but we're also experiencing incredible new human dilemmas in everything from our politics to our ethics.

Now some people say, "Oh, when it doesn't work out with robots, it's just an oops moment." That's what a vice president in a leading military robots company would say, that when your robot doesn't work how it's planned, it's just an oops moment. Well, what are oops moments when you're talking about robotics and the military? Sometimes these oops moments are kind of funny, like when, if you remember, you saw the picture of that machine gun on a robot. It looked like a lawnmower, the Sword System. When they first tested that out in one demonstration, it went squirrely. It started spinning in a circle and pointed its machine gun at the reviewing stand of VIPs. They were not amused. Fortunately, there were no bullets in the gun, so no one was hurt.

Other times oops moments can be tragic, like last year in South Africa. An anti-aircraft cannon had a "software glitch." Instead of firing upwards during a training exercise, the cannon leveled and fired in a circle. It killed nine soldiers because of a software glitch.

We have new questions of law and ethics. For example, what do you do about unmanned slaughter? That is, what do you do when you kill someone that you didn't intend to kill, such as the three times we thought we got Osama Bin Laden with a Predator drone strike, and we got someone else instead? In one case, it was an Afghan civilian who was just unlucky enough to look like Osama Bin Laden when viewed through the soda straw of a Predator drone.

What happens as we move into systems that are making more and more of their own decisions? And don't believe this isn't coming. Actually, during the book, I came across four different Pentagon projects about armed autonomous systems. This development poses entirely new issues.

Take the issue of war crimes. You could argue that war crimes might be less likely with robots because robots are emotionless. Robots don't care if their buddy gets killed. They don't commit a crime of revenge or rage, which is how a lot of war crimes happen. But robots are emotionless. They don't have a sense of empathy, a sense of guilt. A robot looks at an 80-year-old grandmother in her wheelchair the same way they look at a T-80 tank. They're both just zeros and ones in the programming language.

This poses a question: how do we catch up our twentieth century laws of war that are so old right now they qualify for Medicare to these twenty-first century technologies like the Predator Reaper drone that oh, by the way, are applied against enemies that know these laws and are trying to use and abuse them? It's not just you're flying a Predator drone, but it's also going against an enemy that sees a school as a useful base, not something to avoid. We don't have good answers to this right now.

In the book, I asked about a situation in which one of our drones had accidentally killed the wrong people. This was at Human Rights Watch, and two of the senior leaders there had gotten in an argument in front of me about which system of law we should turn to. One of the senior leaders of Human Rights Watch argued that we should turn to the Geneva Conventions. The other one argued that we should turn to *Star Trek's* Prime Directive for guidance.

That's the irony here—in many cases, when people do talk about robotics and ethics, it immediately goes to science fiction. In fact, the science fiction usually isn't *Star Trek*. It's almost always Isaac Asimov and his famous three laws of robotics. If you don't know these, they're pretty simple. Law one is that a robot may not injure a human being or through inaction allow a human being to come to harm. Law two is the idea that a robot must obey orders given to it by human beings except where such orders would conflict with law number one. And finally there's law three, that a robot must protect its own existence as long as such protection doesn't conflict with the first or second law. Later on in these stories, Asimov adds the zero law which comes above all others, and it argues that a robot may not harm humanity or by its inaction allow humanity to come to harm.

The interesting thing is that whenever you meet with any roboticist, they can say those laws almost by heart, and when you open conversations about ethics, it always goes to these three laws. There are problems though. The first is that these laws are fiction. Isaac Asimov wrote them as a plot device, and in all of his stories, the robots following these laws still end up in trouble and causing harm. In fact, the poster for the 2004 movie put it best: "Rules were made to be broken."

There's a second problem with these laws. No technology can yet replicate them inside our machines. One roboticist said, "Asimov's laws are neat, but they're also BS. For example, they're in English. How the heck do I program that?"

The most important reason, though, why we're finding it tough to apply this very smart-seeming idea of ethics to these systems is that they're completely contrary to the way that we utilize these systems in our real world. You don't armor a drone with a Hellfire missile or put a .50 caliber machine gun on a Sword System not to harm humans. That's kind of the point of it. And you don't want a system that goes up to Osama Bin Laden and takes orders from any human. You don't want Bin Laden to be able to say, "Robot, turn yourself off." That's law number two. Law number three, I don't think we want robots with a survival instinct. We're sending them out there to be blown up so that you as future leaders don't have to write a letter home to someone's real-world mother. Also as an aside, there are other science fiction stories that give you an idea why you don't want robots with a survival instinct. If you don't know why, see the *Terminator* movies. You don't want robots with a survival instinct.

The point here is that the people who are paying for these systems, the people that are building these systems, don't want robots that can't kill, don't want robots that take orders from just anyone, and don't want robots with a self-preservation instinct. The bigger issue, though, is when it comes to robots and ethics, we shouldn't be talking about the ethics of the machine itself, because it's a machine. It can't be moral by the very nature of it. We need to be talking about the ethics of the people behind the machines. For example, what is the code of ethics for those who work in the robotics field? What is it ethical to build? What is it ethical not to build? What ethical code would a young roboticist turn to have that question answered for them? It's not like the field of medicine where they have the Hippocratic Oath.

Who gets to use these systems, and who doesn't get to use them? Is the Predator drone just a military technology that just the military should have? If you think so, sorry, it's too late. The Department of Homeland Security already has six of them that it's flying domestically. How about local police forces, should they be allowed to have these kind of sophisticated systems that were originally developed for war? Again, too late. The LA Police Department is right

now purchasing a drone to fly over high-crime neighborhoods, to basically park there and be the universal eye in the sky. I may think that's okay. There's a lot of crime in those neighborhoods. I may get a little more leery about it if that drone is over my neighborhood all the time.

What about me? Is it my Second Amendment right to have a robot that bears arms? These sound again like the questions you would ask at a science fiction convention. Well, that's my very point. They may seem like what one Pentagon analyst described as "near science fiction," but robots are moving past that. These are very real policy and ethical questions.

In conclusion, it sounds like I've been talking about the future of war, but robots are already being used in war. They're already deployed. And so it sets a challenge before us well before you have to worry about your Roomba ambushing you at night. Are we going to let the fact that these look like science fiction, sound like science fiction, feel like science fiction, keep us in denial that these are battlefield reality? Are we going to be like a previous generation that looked at another science fiction-like technology, the atomic bomb? The name "atomic bomb" and the concept come from an H.G. Wells short story. Indeed, the very concept of the nuclear chain reaction also came from that same sci-fi short story. Are we going to be like that past generation that looked at this stuff and said, "We don't have to wrestle with all the moral, social, and ethical issues that come out of it until after Pandora's box is open?"

Now I could be wrong here, and, in fact, one scientist working for the Pentagon told me I was. He said that no ethical or legal issues arise from robots in war, except that he added this: "That is, unless the machine kills the wrong people repeatedly. Then it's just a product recall issue."

There's a lot more to say, but I want to talk with you guys, so I'm going to end on this point. I'm actually going to jump into science fiction. A couple years ago, the American Film Institute gathered a list of the top 100 Hollywood heroes and Hollywood villains of

all time. Out of every single character in every single Hollywood movie, which ones in their view represented humanity at its best and humanity at its worst? Only one character made it onto both the top 100 hero and villain lists. It was the Terminator, a robot killing machine.

That shows me a duality—the duality of our technology for the use of both good and evil. It also shows the duality of the people behind the machines, because it's our human creativity that's distinguished us from every single other species. It's our human creativity that took our species to the moon. It's our human creativity that built works of art and literature and architecture to express our love and our brilliance. And now we're using our human creativity to build something extraordinary. If you believe both the scientists and the science fiction writers, we may be even creating an entirely new species. But we're only doing it because we can't get past our age-old human need to destroy each other. So the real question is this: Is it our machines or is it us that are wired for war?

Questions and Answers

Question

Sir, with the growing dependence on these machines and the inherent strength of their autonomy, aren't we also risking more exposure to cyber terrorism?

Dr. Singer

There is this arrogance that this revolution is the end. Some people believe that we've solved everything, when actually no, revolutionary technologies are just the beginning of this story. You may get new capabilities, but you also get new vulnerabilities. And you hit on one of them.

If you have a system that is dependent on controls from afar, a line of communication, then cutting that line of communication is a key vulnerability that everyone recognizes. In fact, Iraqi insurgents have even started to jam our systems. They're doing a pretty good job at it, but our own unintentional jamming is actually making it harder for the systems. We're actually jamming a lot of our own robots and making them not all that useful.

You open up with these systems an entirely new realm of war. I can't hack into your brain and convince you to stop fighting or to turn your weapon against your mate. With computers, I can hack, and I can persuade that system to do things that the original owner might not want.

There is another side of this, and you need to remember again, we're talking about these systems that are very advanced, that the wars we're fighting are ugly, messy, and dirty. On one hand, you pointed out a high-tech response to them, a high-tech vulnerability that you can go at. But there's also a low-tech side. What is a very

effective countermeasure against that Sword System, that machine-gun-armed robot? As one guy put it, it's a six-year-old with a can of spray paint. Think about it this way. You either have to be incredibly bloody-minded and shoot that six-year-old even though the child is unarmed and six years old, or that child can walk up to your system, spray paint over the visual sensors, and defeat your very sophisticated system. How do you deal with the rules of engagement on that?

I actually posed that question at Joint Forces Command. It was kind of funny. One of the officers then said, "Well, we can load it up with nonlethal systems, and we'll taze that little six-year-old."

There's an inherent problem in that though. You now are going into a war of ideas where there's this wonderful video clip going around of you tazing an unarmed six-year-old. Also, we of course know that it would probably cost a couple million dollars to add on that nonlethal system. Our very cheap, disposable system then turns into a technology race where we're fighting 99-cent spray paint with a multimillion dollar system.

Question

You mentioned at the end of your speech the duality of Terminator, the good and bad side of it, but when you look at robotics, it's kind of scary seeing them evolve from what they were. What's the difference between, say, the evolution of the gun and evolution of these robots?

Dr. Singer

Great question. It actually connects to a lot of questions that people pose in terms of bomber pilots. What's it like to be a mile overhead versus being afar? How is that any different? It's the issue of risk. That bomber pilot, that person behind the gun, still is going to war. The pilot is still exposed to danger even if it's at a distance, even if it's for a few brief moments. The pilot is still on

that same level of risk with those who are targeted. It's a very different story, though, for that drone pilot who experiences no risk. It's not just distancing, it's a disconnect both on a physical level and also arguably on a psychological level.

It poses questions for ethics. When gunpowder was first utilized, many of the people of the day described it as a cowardly technology that should be outlawed, because you weren't fighting right up close. The point here is that again, you get these new technologies that present challenges to existing understandings.

Here's a good example for this crowd, the submarine. The submarine was a technology that came from the realm of science fiction, Jules Verne and the like. And in fact, right before World War I, Arthur Conan Doyle, the writer of the Sherlock Holmes stories, wrote a short story called "Danger" about the use of submarines to blockade Great Britain. It was in 1914. The British Admiralty goes public to mock Arthur Conan Doyle and says that is an absurd idea. Any officer that used submarines in this way would be shot by their own service. Of course, just a few months later, World War I starts, and the Germans actually do carry out a submarine blockade of Great Britain.

It was a dispute over the laws of war as to how they relate to this blockade, as to how submarines should be utilized. The Germans' interpretation versus ours actually leads the United States to join World War I, which leads to us actually becoming a super power. It's these questions of how you utilize these systems and the ethical issues behind them that can have major policy impact and major impact on world history itself.

Question

Sir, is there any official policy on the ethical questions that you posed regarding robots? Do you see us getting absolute answers to those questions? Or do you see us moving ahead on policy without concrete answers, possibly with a sharply divided public?

Dr. Singer

The short answer is the latter. Basically we aren't wrestling with issues that come out of these technologies. After I gave a speech on this book tour, a very senior Pentagon person came up to me and said, "I had no idea we were using this many robotic systems." It was amazing, because he's making decisions that relate to them.

He continued, "The technology is moving so quickly, that I bet one day we'll have the potential of a 3-D version of the Internet. It will look like a little video game, and you can move like a character around in it."

I'm just looking at him. You're talking about virtuals. You're talking about second life. That's not "one day"—that was invented five years ago. But he was viewing this as if it might happen one day, and so it shows how we're often behind the pace of the issues that come out of using these systems. The problem is that we often then make policies and rules that relate to them that lead us down a certain direction that may not turn out to be the best one.

I'll end with a doctrine illustration and an ethical illustration. Doctrine, what is the best way to fight with these systems? Is it simply that you want centralized command and distributed firepower like the mother ship model? Or is it something where you want distributed command and concentrated firepower like a swarm model? Do you want a point-and-click style of warfare where you have people in the middle controlling the systems—point, click, point, click, point, move? Or do you want a lot of systems basically finding the enemy and then converging on them and attacking them from lots of different directions? Those are two very different doctrines. Which one is better?

We don't know. I do know that if we choose the wrong one, we may be like the British and the French after World War I, because the very same debate happened with tanks. Should tanks be distributed around the force just to support infantry, or should they be concentrated into a single iron punch, a blitzkrieg? You choose the

wrong one, you're in trouble. Are we having that kind of debate about doctrine right now?

The same questions apply to ethics. I'll give you an ethical question. Do robots have the right of self-defense? Now one argument could be, well, they are national property, so if someone targets them, it's just as if there is someone inside the system. And in fact, they don't even have to shoot at them, just like if you light up one of our planes with surface-to-air missile radar, you don't even have to fire for us to be able to shoot back at you and kill you on the ground. It's merely the act of pinging us with that radar. The threat is enough.

The other argument could be that you're talking about robots. How can they have rights, and in fact, how could they have the right of a self-defense? There's no "self" in it. The U.S. Air Force has already concluded which interpretation to follow. The U.S. Air Force has actually pushed the cause of robot rights further than any other entity out there, further than science fiction even goes. You target one of our drones even with radar, and we have the right to kill you on the ground right now.

"Morality lurks in all the shadows surrounding our profession. To not only ignore it but fail to embrace it will ultimately ensure your failure in the service."
—VADM James B. Stockdale

The Vice Admiral James B. Stockdale Center for
Ethical Leadership
U.S. Naval Academy
Annapolis, Maryland

tel (410) 293-6085
fax (410) 293-6081
www.usna.edu/ethics