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REVIEW ESSAYS

MORE THAN THREE LAWS OF ROBOTICS

John Edward Jackson

"May you live in interesting times" is frequently used as shorthand for enduring periods of tumultuous change. Few would dispute that global events during the opening decade of the twenty-first century have indeed been "interesting." In his carefully researched and cleverly written book *Wired for War: The Robotics Revolution and Conflict in the 21st Century,* Brookings Institute senior fellow P. W. Singer postulates that technological advances in artificial intelligence and robotics engineering (which together create the robotics revolution) are destined to guarantee that conflict in the twenty-first century will indeed be "interesting"! He effectively argues that the voracious appetite of tech-savvy consumers and the outrage of casualty-averse citizens (and, to a degree, military leaders) will combine to generate an explosion of highly capable robotic systems in the home, office, and battlefield. Society's tolerance for casualties in war has evolved from the public's general acceptance of over five hundred thousand casualties in just five days at the first battle of the Marne at the beginning of the twentieth century to the attitude widely held in the Western world that in the twenty-first century few, if any, young warriors should be required to perish in defense of the republic. The potential for machines to fight to

Professor Jackson is the manager for the Naval War College's Navy Professional Reading Program and a member of its National Security Decision Making faculty. Prior to his retirement from the U.S. Navy in 1996, Captain Jackson was a supply and logistics specialist, serving in his last active-duty assignment as the Naval War College's Frederick J. Horne Military Chair of Logistics. He holds advanced degrees from Providence College and Salve Regina University and is a graduate of the Management Development Program at Harvard University. Professor Jackson is the curriculum developer and moderator of the course "Case Studies in Technology and Warfare: Unmanned Systems."

their last circuit board while their human masters remain safe is an intoxicating, if unrealistic, scenario for future war.

Many observers believe that the combination of supercomputing technology and cutting-edge robotic engineering will drive changes within the military environment equal to the impact of the widespread use of gunpowder in the sixteenth and seventeenth centuries and of steam propulsion for ships in the nineteenth century. These changes relate not only to the development and manufacture of highly capable future systems but also to issues regarding their ethical use and the manner in which command and control will be exercised.

Chapter by chapter, *Wired* displays the history, current status, and possible future of the relationship between man and machine. In a chapter entitled "Smart Bombs, Norma Jeane, and Defecating Ducks: A Short History of Robotics," Singer blends playful prose with extensively annotated research to highlight three hundred years of robotic development. In answering the self-imposed question "Why a book on robots and war?" Singer simply states that "robots are frakin' cool."

For those who may not recognize this version of the ubiquitous "F-word," it is a censor-friendly expletive that peppered the dialogue of the wildly popular remake of the science-fiction classic *Battlestar Galactica*. Singer's unbridled declaration is the first, but by no means the last, reference to science fiction in *Wired*. In fact, when you search for the term "science fiction" in an electronic copy of *Wired for War* on a Kindle e-book reader (which sure seems like a piece of gear Spock would have used in the original *Star Trek* series), you get 196 hits. Singer notes that "science fiction [sci-fi] is more than just popular; it is also incredibly influential, to an extent that is often surprising." He goes on to say that "part of the popularity of science fiction comes from its remarkable skill at foreshadowing the future." He makes his point that would-be futurists should be avid consumers of science fiction by citing the predictions of such writers as H. G. Wells, Jules Verne, and Robert Heinlein, whose visions of the future have in many ways come to pass. Sci-fi fans can be found in the strangest places, and Singer notes that the Joint Chiefs chairman, Admiral Mike Mullen, "proudly describes how the Navy's Professional Reading Program, which he helped develop to guide his sailors, includes the science fiction novels *Starship Troopers* [1959] and *Ender's Game* [1985]." As a point of interest, *Wired for War* is now also a recommended supplemental selection in the Navy's Reading Program.

To be clear, this book is far more than a paean to science fiction, for Singer does a remarkable job of cataloging the ways in which the military forces of the world have adopted robotic technologies. He speaks of the thirteen thousand ground-based robots, six thousand aerial systems, and hundreds of sea-based systems in the active inventory of soldiers, sailors, and airmen around the world.

Singer also describes such sophisticated systems as the RQ-4 Global Hawk, a thirty-two-thousand-pound unmanned reconnaissance airplane with a 130-foot wingspan and a 5,400-mile operating radius. Putting the Global Hawk's operating envelope into more familiar terms, Singer states, "Global Hawk can (in effect) fly from San Francisco, spend a day hunting terrorists in the entire state of Maine, and then fly back to the West Coast." In reality, the RQ-4s fly from bases in the Middle East while being monitored and controlled by pilots sitting at command consoles at Beale Air Force Base, in California. The U.S. Navy is now operating a maritime version of Global Hawk, as part of the Broad Area Maritime Surveillance (BAMS) program. Though the aircraft are launched, recovered, and maintained in the Middle East, all are controlled from Naval Air Station Patuxent River, Maryland. In addition to these reconnaissance tasks, the nightly news is filled with coverage of armed Predator and Reaper unmanned aircraft systems regularly attacking targets in Iraq, Afghanistan, and other locations, in the service of both the U.S. Air Force and the Central Intelligence Agency. Singer goes from these large-scale aircraft to the micro, unmanned air vehicles (some weighing less than a pound) at the opposite end of the size spectrum, to other tactical systems that are literally tossed into the air by soldiers in the field.

On the ground, robots have become indispensable partners to the men and women who risk their lives on a daily basis to locate, disarm, or destroy the primary weapon of the Iraqi insurgency—the improvised explosive device (IED). Singer opens chapter 1 with a touching story about the loss of an explosive-ordnance-disposal technician in Iraq, but he provides a happy ending when he discloses that it was a robot that took the blast—no letter had to be written home to grieving parents. He provides vignettes of troops working side by side with PackBots, SWORDS, throw-bots, TALONS, and even an experimental system called the Robo-Lobster. His forty-five pages of notes provide countless resources for readers who seek to learn more about these systems.

The real strength of this work, however, is that it goes well beyond the science and technology of unmanned robotic systems, delving into the legal and ethical ramifications of their use. Singer weighs the arguments for and against greater autonomy for robotic systems and considers the pros and cons of "keeping a man in the loop" to provide a degree of human judgment in potentially lethal operational decisions. The problem, however, is that decision loops of less than a second make this impossible. He quotes a U.S. Army colonel who says that "the trend towards the future will be robots reacting to robot attack, especially when operating at technologic speed. . . . As the loop gets shorter and shorter, there won't be any time in it for humans." One wonders, however, who is responsible if a robot accidently kills the wrong person. The programmer? The operator? The

vendor who sold the product? Singer does not try to answer these questions but rather encourages the reader to think about them in the context of future wars.

Singer does not limit his learned discussions to war-bots but touches also on robots in the home (more than three million Roomba robotic vacuums have been sold), in research (NASA flies several Global Hawks), and in everyday life (ATMs, security robots, and automated systems in our cars). These topics inevitably lead to a discussion of artificial intelligence and the question of how smart should we allow these machines to become, at what point they might become a threat to their creators. A half-century ago, the noted author Isaac Asimov postulated his famous "Three Laws of Robotics," which sought to ensure the safety and superiority of the human race. In reality, securing our future may require far more than three simple laws.

This book is a must-read for futurists, fans of technology, and students of war. It is, in fact, the required text for a new course at the Naval War College entitled "Case Studies in Technology and Warfare: Unmanned Systems," which was first offered in the 2009–2010 semester.

Singer closes with some sobering food for thought: "And now we are creating something exciting and new, a technology that might just transform humans' role in their world, perhaps even create a new species. But this revolution is mainly driven by our inability to move beyond the conflicts that have shaped human history from the very start. Sadly, our machines may not be the only thing wired for war."