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EMERGING MILITARY TECHNOLOGIES IN THE 21ST CENTURY

SOME THOUGHTS ON GOVERNANCE

Richard M. O'Meara

ABSTRACT

This paper proceeds from three assumptions. First, the *genie* is out of the bottle. Second, the *genie* is capable of good and ill in staggering and perhaps unheard of proportions. And finally, *third,* for humankind to survive the *genie* some sort of governance is both necessary and possible. The *genie* includes a wide range of emerging technologies including nanotechnology, biotechnology, human enhancement, non-lethal weapons, information technology, and robotics. It is argued that that these technologies are being innovated, adapted and used at an unprecedented rate in a culture of technological uncertainty which provides very little time and minimal governance in order to ask the question not *can* we do this but *should* we do this?

This paper reviews the nature of the problem, and then discusses how technological innovation has worked in the past. It then reviews various aspects of the technologies themselves. It takes a specific look at how technology affects the military, and finally provides some suggestions regarding future governance. The paper concludes with the argument that innovation creates untold opportunities for the future of mankind both in the near and far term, but it comes with a price in the form of intended and unintended consequences. The contemporary culture of innovation and use provides very little time or focus on these consequences. It needs to add an ethical dimension to its decision-making process in order to insure that catastrophe is not the consequence of progress.

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RICHARD M. O'MEARA

I wish I could produce a substance or a machine of such frightful efficacy for wholesale devastation that wars should therefore become altogether impossible-Alfred Nobel[1]

This paper proceeds from three assumptions. First the *genie* is out of the bottle. Second, the *genie* is capable of good and ill in staggering and perhaps unheard of proportions. And finally, third, for humankind to survive the *genie* some sort of governance is both necessary and possible. [2]

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[1] Alfred Nobel, *as cited in* Barbra Tuchman, *the Proud Tower, A Portrait of the World Before The War 1890-1914*. The Macmillan Company: New York, 1966, p. 270.

[2] The *genie* for purposes of this discussion includes the entire range of technologies presently being discussed, designed and utilized for use on the battlefield. While there is considerable disagreement regarding how wide-ranging these technologies are-how to define the *genie*?-a general acronym NBIC, standing for nano, bio, info, and cognitive technologies is often used. One conference further provided a list of topics that might fall within this definition to include neurotechnology, artificial general intelligence, synthetic biology, human enhancement, space tourism, social software, prediction markets, smart drugs, bioethics, cleantech, reputation systems, life extension/anti aging, and accelerating change. Convergence 08, Nov 15-16, 2008 *retrieved at* http://www.convergence08.org/, 11/28/2009. Certainly the area of robotics and its applications for military use must be included as well. *See generally,* Armin Krishnan, *Killer Robots, Legality and Ethicality of Autonomous Weapons*. Ashgate Publishing Co: Burlington, Vt, 2009; P.W. Singer, *Wired For War: The Robotics Revolution and Conflict in the 21st Century.* Penguin Group: New York, 2009; Ronald Arkin, *Governing Lethal Behavior in Autonomous Robots*. CRC Press: Boca Raton, Florida, 2009; Patrick Lin, George

INTRODUCTION: THE PROBLEM

> The human race has reached a turning point. Man has opened the secrets of nature and mastered new powers. If he uses them wisely, he can reach new heights of civilization. If he uses them foolishly, they may destroy him. Man must create the moral and legal framework for the world which will insure that his new powers are used for good and not for evil.-Harry S. Truman[3]

Emerging technologies are not new to the battlefield. Indeed, humankind has effected and been affected by the military use of technology since at least the use of stones as weapons.[4]

Bekey, and Keith Abney, *Robots in War: Issues of Risk and Ethics.* California Polytechnic State University. Paper sponsored by the U.S. Department of the Navy, Office of Naval Research under Award # N00014-07-1-1152, 2008. And finally, there is the area of non-lethal weapons ((NLW) which includes technologies across the range of the other technologies which are specifically designed to incapacitate personnel or material, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment. *See generally,* David A. Koplow, *Non-Lethal Weapons, The Law and Policy of Revolutionary Technologies For the Military and Law Enforcement*. Cambridge Univ. Press: Cambridge, 2006; Malcolm Dado, *ed. Non-Lethal Weapons: Technological and Operational Prospects*, Jane's online special report, November, 2000; Non-Lethal Technology Innovation Center, University of New Hampshire, www.unh.edu/ntic; Nonlethal Environmental Evaluation and Remediation Center, Kansas State University, www.engg.ksu/NEER/nonlethal; Institute for Non-Lethal Defense Technology, Pennsylvania State University, www.arl.psu.edu/core/nonlethal.

[3] Harry S. Truman, 'State of the Union Address (4 January, 1950)' *in* William J. Federer, *ed. A Treasury of Presidential Quotations*. Amerisearch: Ashtabula: Oh, 2004. p. 291.

[4] The history of warfare, of course, begins with the written record. The anthropology of warfare, on the other hand, has a considerably longer tail. While there is a good deal of speculation regarding man's inherent penchant for violence, it is clear that many of the characteristics of the successful warrior can also be identified with the successful hunter of the prehistoric age. Prehistorians Henri Breuil and Raymond Lautier for example note:

> [N]o great abyss separating [him] from the animal. The bonds between them were not yet broken, and man still felt near to the beasts that lived around him, that killed and fed him…from them he still retained all the faculties that civilization has blunted-rapid action and highly trained senses of sight, hearing and smell, physical toughness in an extreme degree, a detailed, precise knowledge of the qualities and habits of game, and great skill in using with the greatest effect the rudimentary weapons available.

Henri Breuil and Raymond Lautier, *trans* B.B. Rafter. *The Men of the Old Stone Age.* Greenwood Press: Westport, Ct., 1980. p.71.

Yet, there are many ways to look at the issue. John Keegan notes that some 10,000 years ago there occurred perhaps for the first time a revolution in weapons technology with the appearance of four 'staggeringly powerful new weapons'… the bow, the sling, the dagger and the mace.'[5] And there have been multiple revolutions since. Keegan, for example, divides his discussion of warfare into four general groups: stone, flesh, iron, and fire.[6] These categories refer to the types of technologies described and their impact on civilization. *Flesh,* for example, speaks to the harnessing of animals, specifically horses and the technologies used by horse warriors; chariots, warhorses, large and small, and the composite bow (used on horseback by nomads), etc.[7]

More recently, the literature eschews discussions of specific technologies and speaks in terms of *industrial revolutions* and their effect on tactics and strategy with the warning that actors (traditionally nation-states but increasingly non-state actors) which are unable to recognize the importance of technology and adapt accordingly '… cease to be great…'[8] Here the emphasis is not on the particular technology itself, but rather the ability of the group to envision and

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For a discussion of the propensity of humankind to engage in war s*ee generally* Lawrence Keeley, *War Before Civilization, The Myth of the Peaceful Savage.* Oxford: New York, 1996; Paul K. Chappell, *Will War Even End? A Soldier's Vision of Peace for the 21st Century*. Rvive Books: 2009; Michael Howard, Peter Paret, *ed. and trans. Carl von Clausewitz, On War*. Princeton Univ. Press: Princeton, N.J. 1976. Peace '…is artificial, intricate, and highly volatile.' It is generally characterized by cultural homogeneity, education, and highly qualified elites. p. 609; Colin Gray, *Another Bloody Century: Future Warfare*. Phoenix Paperbacks: London, 2006. Will and Ariel Durant famously calculated in the mid-1960s that there had been only 268 years free of war in the previous 3,421 years. Will and Ariel Durant, *The Lessons of History*. Simon & Schuster: New York, 1968. p. 81; Thucydides, *The History of the Peloponnesian Wars, rev ed. trans* Rex Warner. Penguin (USA): New York, 1954. Assuming the practice of war between city-states, Thucydides concluded that wars are fought out of 'honor, fear, and interest.'1.23.

[5] John Keegan, *A History of Warfare*. Knopft: New York, 1993. p.118.

[6] *Id*. Table of Contents.

[7] *Id*. p.155.

[8] Max Boot, 'Are We the Mongols of the Information Age?' Los Angeles Times, *op-ed,* Oct. 29, 2006 r*etrieved* at http://www.cfr.org/publicatins/11837/are_are_we_the_mongols_of_the_information_age.html. 'Great powers cease to be great for many reasons. In addition to the causes frequently debated-economics, culture, disease, geography-there is an overarching trend. Over the last 500 years, the fate of nations has been increasingly tied to their success, or lack thereof, in harnessing revolutions in military affairs.' p.1. *See also* Max Boot, *War Made New: Weapons, Warriors and the Making of the Modern World.* Penguin (USA): New York. 2006.

organize its application, conceive of its relationship and use with other technologies, and otherwise maximize its benefits as it competes with other groups.

Others continue the de-emphasis of specific technologies and speak of *military-social revolutions*. Williamson Murray, for example, notes

> [T]he next truly revolutionary change in the 'European way of war' after the creation of the modern state came in the political context within which wars were fought in the last decade of the eighteenth century. Between 1792 and 1815 two separate military-social revolutions occurred which again altered the framework of war. The French Revolution completely upset the social and political framework within which the European states had conducted their wars since the Treaty of Westphalia in 1648 [institution of the practice of *levee en masse* and total war], and the Industrial Revolution was to have equally profound implications…
> If technology exercised little influence over the battlefields of this period, it did play a crucial part in the Seventh Coalition's winning the campaign against Napoleon. The Industrial Revolution was at the time changing the way the British economy worked. By revolutionizing the means of production, it altered the basis on which economic activity had rested since the dawn of time- namely, human and animal muscle power. The gains this revolution in economic affairs and technology provided to Britain enabled its government to subsidize the great coalitions against the French, including the last one that destroyed Napoleon's empire.[9]

[9] Williamson Murray, 'War and the West' *Orbis*, Philadelphia, Pa, no. 2 Spring 2008, p.350. Murray continues the analysis to the present:

> World War 1 fundamentally altered the balance between civilian and military technologies. From 1914 through to 1989, military technology drove civil technology. During the interwar years, military organizations pushed the development of technologies like the airplane and radio, with spin-offs like radar, all of which had immense significance for civilians…Today, the 1914-1989 pattern of military technology driving civilian technology has shifted back to the pre-1914 paradigm: technological developments in the civilian world of computers and communications are now driving military technology. p.356.

Another way of getting at the subject is to speak the language of epidemiology and ecology. Here mankind constitute the only significant macroparasites of humankind

> …who, by specializing in violence, are able to secure a living without themselves producing the food and other commodities they consume. Hence a study of macroparasitism among human populations turns into a study of the organization of armed force with special attention to changes in the kinds of equipment warriors used. Alterations in armaments resemble genetic mutations of microorganisms in the sense that they may, from time to time, open new geographic zones for exploration, or break down older limits upon the exercise of force within the host society itself.[10]

Others speak of *revolutions in military affairs* or cultural *ways of war*.[11] Whatever the analysis, it can be agued with a fair degree of certainty that the innovation of emerging technologies has

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[10] William H. McNeill, *The Pursuit of Power, Technologies, Armed Force, and Society Since A.D. 1000.* The University of Chicago Press: Chicago, 1982. p. vii. *See also*, Jared Diamond, *Guns, Germs, and Steel, The Fates of Human Societies.* W.W. Norton & Co.: New York, 1999.

> My main conclusion was that societies developed differently on different continents because of differences in continental environments, not in human biology. Advanced technology, centralized political organization, and other features of complex societies could emerge only in dense sedentary populations capable of accumulating food surpluses-populations that depended for their food on the rise of agriculture that began around 8,500 B.C. But the domesticable wild plant and animal species essential for that rise of agriculture were distributed very unevenly over the continents. p. 426-427.

[11] Russell F. Wegley, *The American Way of War, A History of United States Strategy and Policy.* Indiana University Press: Bloomington, In. 1973; Peter Wilson, 'Revolutions in Military Affairs as Ways of War, 1914-2014,' *Presentation at* Strategic Implications of Emerging Technologies Conference, XX Strategy Conference, U.S. Army War College, Carlisle Barracks, Pa, April 2009. Dr. Wilson outlines four revolutions in military affairs which have resulted in four ways of war for the United States. The first deals with organization around fighting vehicles and the way they communicate; the second deals with irregular warfare (which he believes will become the *regular* way of war); the third involved the standoff in nuclear weapons technology, practiced primarily during the Cold War; and the fourth deals with the present and includes military operations at high speed with low casualties which are rapid and decisive; Mike Guetlein 'Lethal Autonomous Weapons-Ethical and Doctrinal Implications,' *Naval War*

been and will continue to be pervasive, and that their use has considerable impact on the ways humankind operates.[12] Their use on the battlefield, moreover, often defines the ability of human organizations to survive and prosper.

College Joint Military Operations Paper, February, 2005. 'The business of collecting, communicating, and processing information will become its own dimension of warfare. Information systems combined with rapid decision support tools integrated onto a single platform are already driving a revolution in military affairs (RMA).' p. 6. Ajey Lele, 'Technologies and National Security,' *Indian Defense Review*, vol. 24.1 Jan-Mar, 2009. 'Presently, RMA technologies are changing the nature of war-waging by enabling precise destruction of targets from a distance and speeding up the processes of decision making. This quest for modernization caters for(*sic*) emerging capabilities of states potential adversaries, cost factor and raising the technological threshold of armed forces. This advent of the RMA clearly indicates how technology plays an important role in regard to national security.' p.6. Goetz Neuneck and Christian Alwardt sum up the discussion regarding RMA as follows:

> The concept of military revolutions goes back to the 1950s, but as Charles Townhend observed, 'modern war' has to be seen as 'the product of three distinct kinds of change, administrative, technological and ideological,' There have been several revolutions in military strategy throughout history, such as the innovation of the longbow in the 14th century; the introduction of gunpowder and artillery in the 15th; the Napoleonic levee en mass-the first compulsory military service; the communications revolution brought by telegraphy, mechanization in the late 19th and early 20th century, which resulted in such technologies as tanks, aircraft and submarines; and, perhaps most important, nuclear weapons. Williamson Murray and McGregor Knox distinguish between military revolutions and revolutions in military affairs. In their view, military revolutions such as the 'French Revolution' or the 'advent of nuclear weapons' are cumulative and hard to predict in their consequences for modern states and societies. Revolutions in Military Affairs, on the other hand, result in the defeat of enemies (e.g. the 1991 Iraq War), but do not necessarily shape the character of states and societies.

Gotz Neuneck and Christian Alwardt, 'The Revolution in Military Affairs, Its Driving Forces, Elements and Complexity.' *Interdisciplinary Research Group; on Disarmament, Arms Control and Risk Technologies*, Working Paper # 13, May, 2008.

[12] Kevin Coleman concludes:

> Given some in-depth insights into advanced technology research organizations (both public and private), there are wondrous new developments ahead that will shape our lives in ways yet unimaginable. These scientific and technological

Of considerable interest is the increasing availability of emerging technologies in the 21st century and their governance. Some have taken the position that political control has wrested from the innovators the ability to develop and proliferate new and damaging technologies.[13] Others are not so sure.

One neuroscientist worries about the projection of his science into the battlefield without discrimination.

> The long term trajectory of humanity combines a growing capacity for indiscriminate destruction along with vast increase in constructive methods and techniques for solving problems that inhibit human flourishing. Somehow, these seemingly contradictory traits must be neurologically linked. Perhaps, understanding more about this excruciatingly complex system, we can turn ourselves from the wars of the mind to the peace of the soul.[14]

> breakthroughs have far reaching political, economic and social implications. These implications are not limited in scope to the country or jurisdiction where the developments takes place but throughout the world.

Kevin Coleman, 'Technology Driven National Security Strategy,' *Directions Magazine*, Feb. 2004, *retrieved at* http://www.directionsmag.com/printer.php?article_id=521, 12/01/2009.

[13] McNeill, *The Pursuit of Power, ibid*.

> 'The era of upheaval had come to a close. Political management, having monopolized the overt organization of armed force, resumed its primacy over human behavior. Self-interest and the pursuit of private profit through buying and selling sank towards the margins of daily life, operating within limits and according to rules laid down by the holders of political-military power. Human society, in short, returned to normal. Social change reverted to the leisurely pace of preindustrial, precommercial times. Adaption between means and ends, between human activity and the natural environment and among interacting human groups achieved such precision that further changes became both unnecessary and undesirable. Besides, they were not allowed. p.386.

[14] Jonathan D. Moreno, *Mind Wars, Brain Research and National Defense.* Dana Press: New York, 2006. p.184.

Regarding nanotechnology, another commentator cautions:

> Nanotechnologies, as part of a set of converging technologies including biotechnology, information technology, and cognitive science (NBCI), are strongly implicated in expectations of the physical and cognitive enhancements of human beings. Through a variety of plausible mechanisms including pharmaceuticals, nano-enabled neural implants, and brain stimulation, the NBIC enhancement of human beings may allow for the greater exercise of human freedoms, but it holds potential for undermining liberal democratic values as well. In this fundamental ambiguity, such technologies require a significant degree of scrutiny-part of a process we will call 'anticipatory governance.'[15]

There are those in the robotics community who sense that these emerging technologies may foreshadow something different than the traditional intersection between technology and the way humankind operates, both on the battlefield and in society generally. The stakes, according to this argument, are extremely high and, in the language of history, *axial.* Peter Singer, for example, notes:

> [H]umans have long been distinguished from other animals by our ability to create. Our distant ancestors learned how to tame the wild, reach the top of the food chain, and build civilization. Our more recent forebears figured out how to crack the codes of science, and even escape the bonds of gravity, taking our species beyond our home planet. Through our art, literature, poetry, music, architecture, and culture, we have fashioned awe-inspiring ways to express ourselves and our love of one another.
> And now we are creating something exciting and new, a technology that might just transform human's role in their world, perhaps even create a *new species* [emphasis added]. 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.[16]

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[15] David H. Guston, John Parsi, Justin Tosi, 'Anticipating the Ethical and Political Challenges of Human Nanotechnologies,'*in* Fritz Allhoff, Patrick Lin, James Moor, John Weskert. *Nanoethics, the Ethical and Social Implications of Nanotechnology.* John Wiley & Sons, Inc: Hoboken, New Jersey. 2007. p. 185.

[16] Singer, *Wired For War, ibid.* p.436.

And, finally, there are those who believe they see clearly to the bottom of the abyss and find no solace in the idea that humankind has always found a way to master emerging technologies. Bill Joy, for example, a self-styled *generalist*, notes:

> [A]ccustomed to living with almost routine scientific breakthroughs, we have yet to come to terms with the fact that the most compelling twenty-first century technologies-robotics, genetic engineering, and nanotechnology-pose a different threat than the technologies that have come before. Specifically robots, engineered organisms, and nanobots share a dangerous amplifying factor: they can self-replicate…Each of these technologies also offers untold promise: The vision of near immortality that Kurzweil sees in his robot dreams drives us forward: genetic engineering may provide treatments, if not outright cures, for most diseases; and nanotechnology and nanomedicine can address yet more ills. Together they can significantly extend our average life span and improve the quality of our lives. Yet, with each of these technologies, a sequence of small, individually sensible advances leads to an accumulation of great power, and, concomitantly, great danger…The twenty-first century technologies…are so powerful that they can spawn whole new classes of accidents and abuses. Most dangerously, for the first time, these accidents and abuses are widely within the reach of individuals and small groups. They will not require large facilities or rare raw materials. Knowledge alone will enable the use of them.
>
> Thus, we have the possibility not just of WMDs but of knowledge-enabled mass destruction (KMD), this destructiveness hugely amplified by the power of self-replication.
>
> I think it is no exaggeration to say we are on the cusp of the further perfection of extreme evil, an evil whose possibility spreads well beyond that which WMDs bequeathed to the nation-states, on to a surprising and terrible empowerment of extreme individuals.[17]

[17] Bill Joy, 'Why the Future Doesn't Need Us' in Allhoff ed. *Nanoethics*. p. 21-22.

If innovation of these emerging technologies is indeed d*emocratized*[18]*,* that is available to anyone with minimal constraints; if innovation is best encouraged in *fragmented* and competitive environments[19]; and finally, if innovation flourishes best in unregulated spaces,[20]the room for the creation of Joy's *extreme evil* would appear to be great, with no hope of putting the *genie* back in the bottle. Finding the balance between the freedom to *innovate* and the identification of places where innovation *should not go* would appear to be not only rational but necessary.

LEARNING FROM EXPERIENCE: THE INTERSECTION OF TECHNOLOGY AND WARFARE IN THE PAST

> Because technology begets more technology, the importance of an invention's diffusion potentially exceeds the importance of the original invention.[21]

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[18]Charles Duke and Ken Dill, 'The Next Technological Revolution: Will the US Lead or Fall Behind?' *as cited in* Charles Ethan, 'The Nanotechnology R(evolution)' *in* All off, ed. *Nan ethics,* i*bid*. 'Under Open Innovation, a company's value chain is no longer fully contained within the company, and ideas, people, and products flow across company boundaries, to and from other companies, universities, and even countries…The growth of biotechnology in America is largely a story of seedling ideas that came from academic scientists in research universities, funded by venture capitalists, and manned by bright graduate and postdoctoral students'. 98.

[19] Diamond, *Guns, Germs and Steel*, *ibid*. p. 430-431.

[20] Ray Kurzweil, 'On the National Agenda: U.S. Congressional Testimony on the Societal Implications of Nanotechology' *in* Allhoff, *ed. Nanoethics, ibid.*

> As we compare the success we have had in controlling engineered software viruses to the coming challenge of controlling engineered biological viruses, we are struck with one salient difference. As I noted above, the software industry is almost completely unregulated. The same is obviously not the case for biotechnology. A bioterrorist does not need to put his 'innovations' through the FDA. However, we do require the scientists developing technologies to following the existing regulations, which slow down the innovation process at every step. p.52.

[21] Diamond, *Guns, Germs, and Steel, ibid.*

> Often innovation arises from improving and deepening current technologies, using existing tools to find cheaper and more efficient ways to do old things. Sometimes, innovation arises from borrowing ideas from different domains and applying them

It can be argued, with a fair degree of certainty, that technological innovation[22] and its use on the battlefield comprise one of three or four important considerations which have influenced the ability of cultures generally to thrive or decline competitively in the course of human history. Indeed, the literature is robust in support of this proposition.[23]Other considerations

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> in new ways. Occasionally, a radical new innovation like electricity or the transistor comes along, making a whole generation of previously unthinkable technologies newly possible. p.258.

Lee Drutman, 'Where Does Innovation Come from?' *Science & Environment*, Sept, 2009, *retrieved at* http://www.miller-mccune.com/science_environment/where-does-innovation-come-from, 11/23/2009.

[22] Stephen P. Rosen defines a 'major innovation' as

> a change that forces one of the primary combat arms of a service to change its concepts of operation and its relation to other combat arms, and to abandon or downgrade traditional missions. Such innovations involved a new way of war, with new ideas of how the components of the organization relate to each other to the enemy, and new operational procedures conforming to those ideas. They involve changes in critical tasks, the tasks around which warplans revolve.

Stephen P. Rosen, 'New Ways of War: Understanding Military Innovation,' *International Security*, Summer 1988, p. 134.

[23] *See, for example,* Charles Singer *ed. A History of Technology.* Clarendon Press: Oxford, 1954-84 vol. 1-5; Donald Cardwell, *The Fontana History of Technology*. Fontana Press: London, 1994; Arnold Pacey, *Technology in World Civilization*. MIT Press: Cambridge, 1990; Trevor Williams, *The History of Invention.* Facts on File: New York, 1987; R. Stephen Bull, *Encyclopedia of Military Technology and Innovation.* Greenwood Pub: Portland, Or., 2004; Victor Hanson, *The Western Way of War*, *Infantry Battle in Classical Greece*, 2nd ed. Univ. of California Press: Berkley, 1989; Christopher Duffy, *The Military Experience in the Age of Reason*, Barnes & Noble: New York, 1997; Michael Howard, *War in Human History*. Oxford Univ. Press: Oxford, 1976; David Kahn, *Seizing the Enigma*, *The Race to Break the German U-Boat Codes*, *1939-1943*. Barnes & Noble: New York, 2009; John Keegan, *The Price of Admiralty, The Evolution of Naval Warfare*. Penguin Group (USA): New York, 1990; McNeill, *The Pursuit of Power*, *ibid* and *The Rise of the West.* Univ. of Chicago Press: Chicago, 1992; G. Parker, *the Military Revolution, Military Innovation and the Rise of the West, 1500-1800, 2nd ed. Cambridge Univ. Press: Cambridge, 1996;* Noel Perrin, *Giving Up the Gun, Japan's Reversion to the Sword, 1543-1879*. D.R. Godine: Boston, 1988; William Reid, *Arms through the Ages.* Harper Collins*:* New York, 1976; David Showalter *Railroads and Rifles*, *Soldiers, Technology and the Unification of Germany.* Archon Books*:* Hamden, Ct., 1975; Ian Brouma, *Inventing Japan*. Modern Library: New York, 2004; Martin L. Van Creveld *Technology and War*, *From 2000 B.C. to the Present, rev ed.* The Free Press: New York, 1991; Bernard Lewis, *What Went Wrong? Western Impact and*

such as demographics[24], geography[25], and ecology[26] must also take pride of place in the discussion regarding the ability of particular cultures to prosper. Diamond's question in this regard, ('Why did wealth and power become distributed as they now are, rather than in some other way? For instance, why weren't Native Americans, Africans, and Aboriginal Australians

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Middle Eastern Response. Oxford Univ. Press: Oxford, 2002; Charles C. Mann, *1491: New Revelations of the Americas Before Columbus*. Vintage Books: New York, 2006; Diamond, G*uns, Germs and Steel, ibid;* and *Collapse, How Societies Choose to Fail or Succeed*. Penguin Books: New York, 2006.

[24] *See, for example,* P.M.G Harris, *The History of Human Populations: Migrations, Urbanizations and Structural Change*, v. 11. Praeger Pub: Westport, Ct., 2003; Massimo Livi-Bacci, *A Concise History of World Population*, 4th ed. Blackwell Pub.: Oxford, 2007. 'Throughout human history population has been synonymous with prosperity, stability and security…A densely populated region is implicit proof of a stable social order, of nonprecarious human relations and of well-utilized natural resources.' p. 1; Diamond, *Guns, Germs and Steel, ibid.* 'Large populations mean more inventors and more competing societies…All these effects that continental differences in area, population, ease of diffusion and onset of food production exerted on the rise of technology became exaggerated, because technology catalyzes itself. Eurasia's considerable initial advantage thereby was translated into a huge lead as of A.D. 1492- for reasons of Eurasia's distinctive geography rather than of distinctive human intellect.' pp. 263-64.

[25] *See generally Diamond, Guns, Germs and Steel*, i*d* and quotes at footnotes 5 and 19.

[26] Diamond, *Collapse, ibid.*

> 'It has long been suspected that many of those mysterious abandonments [the Anasazi and Cahokia within the boundaries of the modern U.S., the Maya cities in Central America, Moche and Tiwanaku societies in South America, Mycenaean Greece and Minoan Crete in Europe, Great Zimbabwe in Africa, Angkor Wat and the Harappan Indus Valley cities in Asia, and Easter Island in the Pacific Ocean] were at least partly triggered by ecological problems: people inadvertently destroyed the environmental resources on which their societies depended…The processes through which past societies have undermined themselves by damaging their environments fall into eight categories, whose relative importance differs from case to case; deforestation and habitat destruction, soil problems (erosion, salinization and soil fertility losses), water management problems, overhunting, overfishing, effects of introduced species on native species, human population growth, and increased per-capita impact of people.' p. 6.

the ones who decimated, subjugated, or exterminated Europeans and Asians?')[27] is seminal and to date the answers are not completely understood.

Clearly, though, technological innovation has had a huge impact. The ability of humankind to *co-opt, innovate, apply,* and *manage* (regulate?) technologies has made a difference. The history of humankind's reactions to these myriad advancements may contain some lessons regarding contemporary responses to emerging technologies and, therefore, bears reviewing.

As McNeill and others school us, '[P]eople change their ways mainly because some kind of stranger has brought a new thing to their attention. The new thing may be frightening, it may be delightful; but whatever it is, it has the power to convince key persons in the community of the need to do things differently.'[28]Diffusion has occurred in any number of ways and within a variety of contexts-commercial interaction, social interaction, conquest, migrations amongst others-and has not been consistent throughout history. Further, the rate of diffusion, e.g. its speed and the willingness of groups to accept particular ideas and technologies (political will?) has varied widely as well. There appear to be a number of reasons for this phenomenon. Diamond, for example, concludes that human ingenuity is, perhaps, the least important factor. He hypothesizes that geography, perhaps more than any other condition, has affected both the speed of diffusion and political will most.[29]

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[27] Diamond, *Guns, Germs and Steel, ibid*, p.

[28] McNeill, *A History of the Human Community*, *ibid,* p. X111. Anthropologists refer to this phenomenon as 'cultural diffusion,' and it appears to apply to all manner of human endeavors such as religion, economics, political organization, the exchange of human ideas generally and most importantly for the purpose of this discussion technological innovation.

[29] Diamond, *Guns, Germs, and Steel, ibid*. p.426. His conclusions regarding the inability of the Incan civilization and civilizations in Sub-Saharan Africa to remain competitive with Europeans are instructive.

> Thus Pizarro's capture of Atahuallpa illustrates the set of proximate factors that resulted in Europe's colonizing the New World instead of Native Americans' colonizing Europe. Immediate reasons for Pizarro's success included military technology based on guns, steel weapons, and horses; infectious disease endemic in Eurasia; European maritime technology; the centralized political organization of European states, and writing…p. 80.
>
> In short, Europe's colonization of Africa had nothing to do with differences between European and African peoples themselves, as white racists assume. Rather, it was due to accidents of geography and biogeography-in particular, to the continents' different areas, axes, and suites of wild plants and animal species. That is, the different historical trajectories of

There are other considerations as well which may be deemed *cultural*, although their relationship to geography and ecological circumstance bears remembering. Europe, for example, was blessed early-on with the use of the wheel and the domestication of animals.[30] These technological innovations, amongst many others, migrated across Eurasia fairly easily,[31] and contributed considerably to the ability of Europeans to communicate, transport goods and ideas, and otherwise benefit from a relatively free (unregulated) exchange of innovations. On the other hand, the continent remained until very recently a fragmented space, chock full of competing political, social and economic centers of power, and eager to a fault to obtain an advantage, one against the other.[32] The separation of the Roman Church from the other political arrangements during the Middle Ages, unlike in Byzantium and China, for example, insured that no over-arching regulation of ideas and technologies could occur.[33] It is generally accepted that this set of political and social arrangements created a culture of competitiveness only aggravated by the practice of Enlightenment individualism and capitalism and the pecularism of nationalism. Indeed, even the worst effect of these arrangements-multiple and massive warfare from the 17th through the 20th centuries-contributed to an environment of technological innovation seen nowhere else on the planet.[34]

> Africa and Europe stem ultimately from differences in real estate. p. 401.

[30] Diamond, *Guns, Germs and Steel, id*. p. 182.

[31] Diamond, *Guns, Germs and Steel, id.* p. 190.

[32] Yale H. Ferguson and Richard W. Mansback, *Remapping Global Politics, History's Revenge and Future Shock.* Cambridge Univ. Press: Cambridge, 2004 pp. 230-32; Richard Langhorne, *The Coming of Globalization: Its Evolution and Contemporary Consequences.* Palgrave: New York, 2001.

[33] McNeil, The Pursuit of Power, *ibid.* pp. 68-70.

[34] Keegan, *A History of Warfare, ibid.* p. 390. Noting the cultural differences between Chinese and Western attitudes towards warfare and military technology, Keegan offers one answer regarding the question of why the West and not the East was open to the changes that technology offered:

> We should, however, recognize that a major factor closing Asian culture to such adaption [the gunpowder revolution] was its adherence to a concept of military restraint that required its elites to persist in the use and monopoly of traditional weapons, however obsolete by comparison with those coming into fashion elsewhere, and that this persistence was a perfectly rational form of arms control. The western world, by forsaking arms control, embarked on a different course, which resulted in a different form of warfare that Clausewitz said was war itself, a continuation

The West, then, has exhibited an unparalleled ability to *co-opt* technology and bend it to its use, *adaption*, through its history. As Alex Roland concludes, while technology does not determine their use and the ultimate intended and unintended consequences thereof, certain cultures have exhibited a willingness to walk through the *open door* of technological possibility more than others. The West has been one of those cultures.[35]

While there are multiple examples of technological *co-option* in human history[36], two are particularly instructive and make the point: the adoption of the stirrup in 7th century Europe and gunpowder in the 15th century. Those who dominated military culture in the Early Middle Ages in Europe were the inheritors of at least two military traditions with which to confront the extremely serious security dilemma of bands of mounted cavalry swarming from the steppes of the East and across the Pyrenees. The Roman tradition, characterized primarily by well organized and disciplined units of infantry, was difficult to continue in a world with little ability to marshal, train and maintain large groups of professional warriors.[37] Dismounted infantry also worked poorly against mounted cavalry, capable of rapid movement and the ability to retreat at will. Nor did its emphasis on unit cohesion speak to the Germanic tradition of individual warfare and its reverence for individual combat, reward and reputation.[38]

> of politics, which he saw as intellectual and ideological, by means of combat, which he took to be face-to-face, with the instruments of the Western technological revolution, which he took for granted. pp. 390-91.

[35] Alex Roland, 'Presentation Notes at the Teaching the History of Innovation Workshop,' published in *Footnotes, Foreign Policy Research Institute, retrieved at* http://www.fpri.org/footnotes/1402.200902.roland.wartechnology.html, 11/22/2009. 'The open door is a powerful conceptual tool for thinking about all technology, especially military technology. It adds what most accounts of technological innovation lack: human agency.' p. 4.

[36]There is substantial evidence that transformative technologies arise, not from 'thinking outside the box', ingenuity and genius etc., but, rather from *combinational evolution*, a process whereby technologies are put together from other technologies, often to solve the unintended consequences of former technologies. *See generally,* W. Brian Arthur, *The Nature of Technology, What It Is and How It Evolves.* The Free Press: New York, 2009; McNeill, *A History of the Human Community, ibid*. p. X111.

[37] David Grossman, 'Evolution of Weaponry, A Brief Survey of Weapons Evolution. The Roman System.' *Killology Research Group,* 1999, *retrieved at* http://www.killology.com/art_weap_sum_roman.htm, 11/23/2009.

[38] John Sloan, 'The Stirrup Controversy' posted on discussion list medieval@ukanvm.cc.ukans.edu on 5 October 1994 as part of the thread 'The Stirrup Controversy,' *retrieved at* http://www.fordham.edu/halsall/med/sloan,html, 11/23/2009.

As would appear clear from the discussion above, the idea of the stirrup diffused into Europe from multiple sources over a fairly long period of time, not the least of which were the Byzantine Empire and the Saracen advances through Spain in the 8th century A.D. Some theorize that the stirrup was introduced by the Lombards and Avars;[39] others credit the Franks with its *co-option* and general use. The point here is that this technology, cheap and readily adaptable to a relatively disorganized military organization of minimal numbers seeking mobility against mounted cavalry, affected the balance of power considerably. Had the Franks, and others, continued to ride to battle without the stirrup and the heavy armor and lance which the stirrup permitted, they would have continued to dismount to fight. Further the geographical reach of Charlemagne and others would have been severely limited as well. And their ability to close with and destroy mounted cavalry would have continued to be neglible. Some have argued that this piece of technology (and more importantly the ability to *adapt* it for uses on European battlefields) changed the entire socio-economic, political, and cultural history of Europe. Others disagree with these wide-ranging conclusions. No one, however, denies the fact that *co-option* and *adaption* of this technology changed the paradigm of war-making in Europe, in multiple ways for centuries.[40]

The history of gunpowder technology is, perhaps, a more obvious example of the effects of *co-option* and *adaption.* Gunpowder was not new to human history in the Middle Ages.[41] Its *co-*

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[39] David Edge, John M. Paddock, *Arms and Armor of the Medieval Knight.* Crescent Books: New York, 1988.

[40] Lynn White, Jr. in 1966 credited the entire socio-political phenomenon of feudalism to *co-option* of the stirrup.

> 'Few inventions have been so simple as the stirrup, but few have had so catalytic an influence on history. The requirements of the new mode of warfare which it made possible found expression in a new form of western European society dominated by an aristocracy of warriors endowed with land so that they might fight in a new and highly specialized way…The Man on Horseback, as we have known him during the past millennium, was made possible by the stirrup.

Lynn White, Jr. *Medieval Technology and Social Change*. Oxford Univ. Press: Oxford, 1966. p. For a discussion of the multiple disagreements with White's thesis *see* Sloan, 'The Stirrup Controversy,' *ibid;* Alex Roland, 'Once More Into the Stirrups: Lynn White, Jr., Medieval Technology and Social Change,' *Technology and Culture,* v. 44, n. 3 July 2003, pp. 574-585.

[41] Keegan, *History of Warfare, ibid,*

> Fire is a weapon of great antiquity. In the form of 'Greek fire' it was first brought into use by the Byzantines in the seventh century. They guarded the secret of its composition so carefully that even today scholars debate about the exact nature of its

option and then *adaption* to European and then global projects appear to have made all the difference. First, Europeans applied its use to a whole range of stand-off weapons which challenged the defensive castle warfare of the fifteenth and sixteenth centuries.[42] Cannon, created in conjunction with bell foundry technology already well developed in Europe, were mobile, reasonably accurate, and immediately decisive in a wide rage of operations.[43]Their

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> ingredients. All that is known for certain is that it was discharged in liquid form, by a sort of syringe, chiefly as an incendiary agent against wooden structures in siege and naval warfare. It was not 'fire' in the modern sense of a propellant or explosive. It was not, for all the fear it aroused and mystery that surrounded it, a very effective innovation. It did not revolutionize warfare, as the coming of gunpowder would do.
>
> Gunpowder nevertheless connects with it, for it is now believed the basis of 'Greek fire' was what the Babylonians called 'naphtha' or 'the thing that blazes', a seepage from surface deposits of petroleum. They found no practical use for it. In China, however, about the eleventh century AD, it was discovered that intermixing naphtha-based substances from local surface seepages with salpetre yielded a compound that had explosive as well as incendiary properties. The Chinese had earlier stumbled on the discovery that lighting fires, particularly of charcoal, on soils that contained high concentrations of sulphur also produced explosive effects. When purified sulphur was combined with powdered charcoal and crystalline saltpetre-this was perhaps first done for semi-magical purposes in Taoist temples about AD 950-what we now call gunpowder resulted. Whether the Chinese used it in warfare is much disputed. There is no evidence that they made cannon (as opposed to fireworks) before the end of the thirteenth century; soon after that date gunpowder was certainly known also in Europe…p.319.

[42] Again, standoff weapons, those which permitted the projection of violence without the necessity of face-to-face contact were not unknown before the age of gunpowder. The catapult and other such contrivances have a history which long predates even the Greeks and is global in its applications. The long-bow in Europe was particularly influential in operations between the English and French as well. Captain Anton, 'A Short History of the English Longbow.' *Archers of Ravenwood, retrieved at* http://www.archers.org/default.asp?section=History&page=longbow, 11/23/2009; Keegan, *The Face of Battle.* Penguin Group (USA): New York, 1978.

[43] Christopher Duffy. Sie*ge Warfare: The Fortress in the Early Modern World, 1494-1660*. London, 1979.

> French craftsmen and bell-founders…by the 1490s…had evolved a cannon that was recognizably the same creature that

expense hastened the shift from independent war-makers to more centralized polities and forms the basis for at least part of the reason for the formation of the modern state. [44] The progression of gunpowder technology into the area of individual use-the musket and then the rifle-are of equal and, perhaps, more importance. The wide-scale arming of individual infantrymen with muskets and ring bayonets required considerable improvement in methodologies of finance, regimens of discipline, and interactions between commerce and the state.[45] *Adaptions* of these technologies have created the categories of weapons systems which continue to dominate the contemporary battlefield.

> was going to decided battles and sieges for nearly four hundred years to come. The heavy 'built-up' bombard, firing a stone ball from a wooden platform that had laboriously to be lifted onto a cart whenever it changed position, had been replaced by a slender, homogeneous bronze-cast tube, no more than eight feet long, its proportions carefully calculated to absorb the progressively diminishing shock of discharge from breech to muzzle. It fired wrought iron balls, heavier than their stone equivalents but, because of that, of three times' greater destructive effect for a given bore. pp. 8-9.

[44] McNeill, *Pursuit of Power, ibid*. 'In Europe, the major effect of the new weaponry was to dwarf the Italian city-states and to reduce other small sovereignties to triviality.' p. 89; *see also* Philippe Contamine, *ed. War and Competition Between States*. Oxford Univ. Press: Oxford, 2000; Patrick Carroll, *Science, Culture, and State Formation*. Univ. of California Press: Berkley, 2006.

[45] McNeill, *id*.

> European kings and captains had clearly accepted the idea that improvements were always possible. An efficient information network utilizing printed texts as well as word of mouth espionage, and commercial intelligence, spread data about enemy intentions and capabilities, new technologies, and new tactics across the length and breadth of western Europe. As a result, by the end of the Thirty Years War, European armies were no longer a mere collection of individually well-trained and bellicose persons, as early medieval armies had been, nor a mass of men acting in unison with plenty of brute ferocity, but no effective control once battle had been joined, as had been true of the Swiss pike men of the fifteenth century. Instead, a consciously cultivated and painstakingly perfected art of war allowed a commanding general, at least in principle, to control the actions of as many as 30,000 men in battle. Troops equipped in different ways and trained for different forms of combat were able to maneuver in the face of an enemy. By responding to the general's

From a global perspective, the *adaption* of gunpowder technologies to naval science in the 15th century led to the ability of the west to dominate naval warfare-and therefore the global commons-and must be considered, therefore, of equal if not larger significance. Early on, the ability of Atlantic fleets to create powerful platforms for cannon almost immediately changed the balance of power throughout the oceans of the world and wiped out millennia of traditional naval tactics. McNeill notes:

> Heavy guns, routinely carried by ordinary merchant ships, allowed the amazingly rapid expansion of European dominion over American (beginning 1492) and Asian (beginning 1497) waters. The easy Portuguese success off the port of Diu in India against a far more numerous Moslem fleet (1509) demonstrated decisively the superiority that their long-range (up to 200 yards) weapons gave to European seamen against enemies whose idea of a sea battle was to close, board, and fight it out with hand weapons. As long as cannon-carrying ships could keep their distance, the old-fashioned boarding tactics were utterly unable to cope with flying cannonballs, however inaccurate long-range bombardment may sometimes have been.[46]

Of considerable interest, is the failure of other cultures to *adapt* the same technologies in order to compete with the voracious proclivities of the west. China, after all, is credited with inventing gunpowder, the stirrup and the crossbow, and the gates of Constantinople-and hence the last vestiges of Roman Empire-were breached by the Ottoman Turks in 1453 with the use of heavy cannon.[47]The answer appears to lie in the spheres of culture and politics. Here, it can be argued, are the first seeds of *regulation* of the *genie*. The irony, of course, is that this *regulation*

> command they could take advantage of some unforeseen circumstance to turn a stubbornly contested field into a lopsided victory. European armies, in other words, evolved very rapidly to the level of the higher animals by developing the equivalent of a central nervous system, capable of activating technologically differentiated claws and teeth. pp. 123-24.

[46] McNeil, *id*. pp. 99-100.

[47] Roger Crowley, 'The Guns of Constantinople', HistoryNet.com *retrieved at* http://www.hstorynet.com/theguns-of-constantinople.htm 11/24/2009; Steve Runciman, *The Fall of Constantinople, 1453*. Cambridge Univ. Press: Cambridge, 1965. Ironically the cannon technology that ultimately defeated Constantinople had been offered first to the Emperor by a Hungarian inventor. The Emperor found it useful but too expensive.

had the disastrous consequence of rendering these cultures, Chinese specifically and Islam generally, incapable of competing with what is often referred to as *modernity*.[48]

China, for example, has been characterized for centuries as culturally conservative, defined by a Confucian belief in order and the centrality of government originating in part as a result of the social and economic implications of rice paddy culture and a near constant threat of anarchy. The commercial and military professions have traditionally been seen as lesser occupations and did not hold prestige as did bureaucratic service and landholding.[49] Further, what can be

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[48] *Modernity* is a much argued concept which is often defined in Euro-centric terms, especially when it speaks to the importance of the scientific and commercial revolutions, the Enlightenment, the Industrial Revolution and globalization. Clearly though, it is bound up at least in part with issues of *co-option* and *adaption* of technology. Richard Hooker provides one definition:

> Modernity is simply the sense or the idea that the present is discontinuous with the past that through a process of social and cultural change (either through improvement, that is progress, or through decline) life in the present is fundamentally different from life in the past. This sense or idea as a world view contrasts with what I will call tradition, which is simply the sense that the present is continuous with the past, that the present in some way repeats the forms, behavior, and events of the past.

Richard Hooker, *Enlightenment Glossary, World Civilizations, 1996, retrieved at* http://www.wsu.edu:8080/-dee/GLOSSARY/MODERN.HTM, 11/24/2009.

Others address the issue of technology specifically:

> For more than a century 'modernity' has been a key theoretical construct in interpreting and evaluating social and cultural formations. What it means to be 'modern,' however, is by no means clear. The term is bound up with overlapping and controversial notions about the imperatives of change and progress, of rationality and purposeful action, of universal norms and the promise of a better life…
>
> In common speech, 'modern' is often a synonym for the latest, and it is assumed, inevitably the best, in a triumphant progression to the present…As expressions of The New, these products [cyber-prosthetics, computers, designer drugs, personal organizers, etc.] have inherited the myth of progress, modernity's defining legend. The legend of progress through a parade of technologies, which has especially deep roots in American culture, forms a stock-in-trade for contemporary advertising.

Thomas J. Misa, Philip Brey, Andrew Feenber eds. *The Compelling Tangle of Modernity and Technology*. MIT Press: Cambridge Mass., 2004. p.5.

[49] McNeill, *A History of the Human Community, ibid*. p.331.

described as the Chinese *way of war*, as enunciated by Sun Tzu and others, emphasized avoiding battle except with the assurance of victory, disfavoring risk, seeking to overawe an enemy by psychological means, and using time rather than force to wear an invader down.[50] These are all profoundly anti-western in philosophy and practice and hardly encourage a free wheeling competition of ideas and innovation.[51] Finally, there is the issue of command economies and their relationship to innovation. Unlike China, Constantinople and Islam generally, Europe never succeeded in melding church and state into one institution. Technological innovation proceeded in these cultures, when it did, as a result of the decisions of one source of power whose agendas were mostly concerned with maintenance of order and the status quo.[52] The ability to *regulate* the methodologies of warfare, then, was considered one of the virtues of governance.[53]

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[50] Contemporary leadership guidance regarding foreign and security policy continues in this vein:

> …Chinese strategists and analysts occasionally cite guidance from former paramount leader Deng Xiaoping in the early 1990s: 'observe calmly; secure our position; cope with affairs calmly; hide our capacities and bide our time; be good at maintaining a low profile; and never claim leadership.' This guidance reflected Deng's belief that China's foreign policy and security strategy had to reinforce its core national interest of promoting domestic development by avoiding foreign risk, high-profile international engagement and provocations, or pretenses of international leadership.

Office of the Secretary of Defense, 'Annual Report to Congress, Military Power of the People's Republic of China, 2009.' 2009.

[51] Keegan, *A History of Warfare, ibid*. p. 202.

> Long before any western society had arrived at a philosophy of war, the Chinese had devised one. The Confucian ideal of rationality, continuity and maintenance of institutions led them to seek means of subordinating the warrior impulse to the constraints of law and custom…Nevertheless, the most persistent feature of Chinese military life was moderation, designed to preserve cultural forms rather than serve imperatives of foreign conquest or internal revolution. Among the greatest of Chinese achievements was the sinicisation of successful steppe intruders and the subordination of their traits to the civilization's central values. p.388.

McNeil, *A History of the Human Community, ibid*. pp. 330-31.

[52] The history of China, for example, is characterized by spurts of technological innovation and *adaption*, driven primarily by the government. In 1436, the Emperor issued a decree

Islam, too, has had a tradition of restraint in war-making that has proven beneficial, at least in part, over the ages. Despite its reputation for conquest and its early successes in this regard, the theology of Islam schools a prohibition against war, one Muslim against the other. Keegan argues that this prohibition led to the formation of a specialist and subordinate class, '…thus freeing the majority from military obligation and allowing the pious to emphasize in their personal lives the 'greater' rather than the 'lesser' aspect of the injunction to wage holy war, 'the war against self.''[54]Command politics and economies and emphasis on a single path in all things, according to Bernard Lewis, however, have rendered a once great, advanced, and open civilization '…poor, weak, and ignorant.'[55]

The above short history, demonstrates, in part, that technological innovation is nothing new to humankind, indeed it may well form part of the definition of what it means to be human. Certain conclusions may be drawn from past experience:

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effectively shutting down the seagoing industry, closing shipyards and making it illegal to promote commerce overseas. This is especially significant since by then China had a growing naval commercial industry which routinely traded in the Indian Ocean and had reached the coast of Africa. McNeill, *Pursuit of Power, ibid.* pp. 44-46.; Louise Levanthes, *When China Ruled the Seas: The Treasure Fleet of the Dragon Throne, 1405-1433.*Oxford Univ. Press: Oxford, 1994.

[53] Another example of *regulation* is the decision by the Japanese elites to forgo the use of the known and developed technology of musketry and cannon in the 16th century in favor a traditional weapons, cavalry, bows, swords, etc. Perrin, *Giving Up the Gun*, *ibid;* Stephen Mirillo, 'Guns and Government, A Comparative Study of Japan and Europe.' *Journal of World History, v*. 6, no. 1, 1995.

[54] Keegan, *A History of Warfare, ibid*. p. 389. *See also* Sayyid Imam al-Sharif, *Rationalizing Jihad in Egypt and the World*, 2007 *as cited in* Jared Brachman, 'Al Qaeda's Dissident,' F*oreign Policy,* Special Edition, 2009 p. 40, in which he argues that Al Qaeda's use of mass violence against fellow Muslims is in violation of Islamic law. This is especially relevant, according to Brachman, because Sharif is one of the founders and original ideologues of the movement.

[55] Lewis, *What Went Wrong? Ibid.* p.151. His *fix* for these conditions is admittedly western:

> To a Western observer, schooled in the theory and practice of Western freedom, it is precisely the lack of freedom-freedom of the mind from constraint and indoctrination, to question and inquire and speak; freedom of the economy from corrupt and pervasive mismanagement; freedom of women from male oppression; freedom of citizens from tyranny-that underlies so many of the troubles of the Muslim world. But the road to democracy, as the western experience amply demonstrates, is long and hard, full of pitfalls and obstacles. p.159.

1. there are many things which affect the ability of a culture to *co-opt* and *adapt* new ideas, especially technological ideas. Some of these are the existence of social, political and economic environments where new technology is prized and rewarded;

2. innovation is often, if not always, the product of *co-option* and *adaption.* While all innovation is not the result of providing a response to an immediate or emergent challenge, immediate and emergent challenges often spur perceived *fixes*, all of which have unintended and often far-reaching consequences; and

3. there has been a good deal of *regulation* regarding technological innovation which has attempted to control the means available to project violence, restricting its use to certain groups and certain practices within cultures. While this regulation has been beneficial, it has also had the affect of leaving cultures open to conquest by other more unregulated cultures.

THE SCOPE OF EMERGING TECHNOLOGIES

> There are limits to how far we can go in changing our human nature without changing our humanity and our basic human values. Because it is the meaning of humanness (our distinctness from other animals) that has given birth to our concepts of both human dignity and human rights, altering our nature necessarily threatens to undermine both human dignity and human rights. With their loss, the fundamental belief in human equality would also be lost…If history is a guide, either the normal humans will view the 'better' humans as 'the other' and seek to control or destroy them, or visa-versa. The better humans will become, at least in the absence of a universal concept of human dignity, either the oppressor or the oppressed.-George Annas[56]
>
> If it saves American lives on the battlefield, do it!-Anonymous U.S. Joint Planning Officer at Department of Defense.
>
> I have set before you life and death, blessing and cursing: therefore choose life, that both thou and thy seed may live-Deuteronomy 30:19

[56] George Annas, 'The Man on the Moon, Immortality and Other Millennial Myths: the Prospects and Perils of Human Genetic Engineering', *Emory Law Journal* 49: 3(Summer 2000). p. 773.

The scope of contemporary technological innovation is both impressive and staggering. Indeed, for the average consumer of these technologies, whether on the battlefield or in daily life- the general who orders this technology, the politician who pays for it, the user whose life is changed by it, even the Luddite who rails against it- these technologies are magic. They are incomprehensible in the manner of their creation, the details of their inner workings, the shear minutiae of their possibilities. They are like the *genie* out of the bottle and clamoring to fulfill three wishes; guess right and the world is at your fingertips, guess wrong and there may well be catastrophe. And you have to guess quickly for the *genie* is busy and has to move on. There are, of course, shamans who know the *genie's* rules, who created the *genie* or at least discovered how to get it out of the bottle. You go to them and beg for advice regarding your wishes. What should I take from the *genie*? How should I use my wishes? Quickly tell me before I loose my chance and the *genie* makes the choices for me. And you find that the shaman is busy with new *genies* and new bottles and hasn't given your choices much thought at all. He may stop to help you ponder your questions, but most probably he goes back into his tent and continues his work. 'You're on your own kid…Don't screw up!'[57]

Discussions regarding the scope of emerging technologies are often difficult due to the breadth and sophistication of the information about them. They often descend into ramblings about gadgets and gizmos and reflect the short answer to Singer's question, 'why spend four years researching and writing a book on new technologies? Because robots are frakin' cool.'[58]Because innovation is and has always been catalytic, feeding off itself, reacting to its

[57] There are multiple ironies regarding the intersection of technology and war, not the least of which is Alex Roland's thesis that '[A]s warfare became more lethal in the second half of the twentieth century, it killed fewer people. Casualties from war fell by 82 percent between 1950 and 1995.' Alex Roland, 'Keep the Bomb,' *Technology Review,* August/September 1995. pp. 67-69. These ironies are further explained by Roland by the fact that there is no specific academic discipline which has dedicated itself to the intersection of technology and warfare.

> …no discipline speaks for technology. Engineering, of course, works on technology, but seldom studies it as a social phenomenon. Technology assessment is most often a subset of engineering, concentrating on the impact or results of technology. The study of technology has spawned identifiable fields within traditional disciplines such as history, sociology, and even philosophy. And new fields, such as the social study of science and technology have appeared. But there remains no scholarly discipline devoted exclusively to technology.

Alex Roland, 'Technology and War,' *American Diplomacy*, 1997, *retrieved at* http://www.unc.edu/depts/diplomat/D_ISSUES/AMDIPL_4/ROLAND.HTML 11/24/2009.

[58] Singer, *Wired for War, ibid*. p.1.

intended and unintended consequences,[59] influenced by the environment in which it is created and creating new environments as it goes, the discussion must, or course, be much longer and more nuanced. Of equal importance is the fact that demands for emerging technologies are coming faster and faster[60], and, as we have seen, failure to keep up can have disastrous effects on the battlefield.

One approach is to look at three separate areas of the discussion. First, the types of technologies which are making their way onto the battlefield; second, the environment in which they are created and used; and third, some crossroads (ethical dilemmas?) which these technologies create.

OF GADGETS AND GIZMOS

As indicated above, emerging technologies are often categorized in terms of the specialists who engineer them; thus, we speak in terms of nano, bio, info, and cognitive technologies (NBIC). In terms of the most immediate effect on the battlefield, however, it is, perhaps, more appropriate to look at nanotechnology, human enhancement technologies (including nueroscience), robotics, non-lethal weapons and information technology. These are, in multiple forms, already on the battlefield; their uses are proven, and their possibilities identified for further use. Further, they are shaping-and being shaped by-the environments in which they have been employed.

Nanotechnology, in a sense, is not a separate discipline at all, but rather, in part, a way of reducing the size of things-biological, robotic and informational things, amongst others. It is

> …the science that deals with objects with at least one dimension between one and one hundred nanometers in length, a size range called the nanoscale. A nanometer is one one-billionth of a meter, which is pretty close to one one-billionth of a yard. For

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[59] Charles J. Dunlap, Jr. 'Technology and the 21st Century Battlefield: Recomplicating Moral Life for the Statesman and the Soldier.' Carlisle Barracks, PA: St*rategic Studies Institute*, January 15, 1999; Noah Schachtman, 'How Technology Almost Lost the War: In Iraq, The Critical Networks are Social-Not Electronic.' *Wired Magazine,* no. 15.12, November, 27, 2007.

[60] The U.S. Department of Defense recognizes that its primary challenge is keeping up with demands for rapid fielding of technologies.

> The requirements process and AF doctrine for unmanned systems has not kept pace with evolving technologies and the urgent needs of the Warfighter. Requirements creep and demands for rapid fielding have led to problems with existing and developmental unmanned platforms. It is likely that demands for rapid fielding will continue.

Department of Defense, *FY2009-2034 Unmanned Systems Integrated Roadmap*, p. 39.

> comparison, a human hair is approximately 50,000 nanometers across, and a nanometer is as much smaller than a football as a football is smaller than [the] distance from the earth to the moon. Anything small enough to be measured in nanometers is much too small to be seen with the naked eye….Nanoscale objects are not just small, they are a special kind of small. Individual atoms are around one-fifth of a nanometer. The size of almost all molecules from alcohol to sugar to caffeine lies within the nanoscale, because it is the smallest level at which functional matter can exist-anything smaller is just a minute speck of vapor. Material designed at the nanoscale can therefore be designed with molecular precision. This means that, through nanotechnology, we can make materials whose amazing properties can be defined in absolute terms. This is not only the strongest material ever made, this is the strongest material it will ever be possible to make.[61]

Nanotechnology, then, is used to change and make more efficient a wide range of other engineered technologies from fiber optics, to optics, to fabrication, to biology, to robotics. In application, nanotechnologies reduce the weight of objects and the speed with which information is transmitted. They contribute to the enhancement of humans through prosthetic technologies, and reduce the cost of making things generally.[62] It is recognized that its benefits '…will shift paradigms in biomedicine (e.g. imaging, diagnosis, treatment, and prevention; energy (e.g. conversion and storage); electronics (e.g. computing and displays) manufacturing; environmental remediation; and many other categories of products and applications.'[63]

> Perhaps the most important aspect of nanoscience and nanotechnology is the ability to respond to what might be called grand challenges. These are major problems such as diagnosing particular forms of cancer, stopping corrosion on metal bridges, providing early warning of heart malfunctions, developing environmentally friendly and significant new energy sources,

[61] Daniel Ratner, Mark A. Ratner, *Nanotechnology and Homeland Security, New Weapons for New Wars.* Pearson Education, Inc: Upper Saddle River, N.J., 2004, p.8.

[62] *See generally,* Jurgen Altman, *Military Nanotechnology, Potential Applications and Preventive Arms Control.* Routledge: New York, 2006; Daniel Moore, 'Nanotechnology and the Military' *in* Allhoff, *ed*. *Nanoethics, ibid*, pp. 267-275.

[63] President's Council of Advisors on Science and Technology, 'National Nanotechnology Initiative: Second Assessment and Recommendations of the NNAP,' April, 2008, p.1.

> providing total assurance of food safety, producing reliable long term storage of information, and so on.[64]

Human enhancement generally and neuroscience specifically have as their goal, at least in part, intervention into the human organism for the purpose of changing it. One Director of the Defense Advanced Research Projects Agency (DARPA) in 2003 advised Congress that the goal is to exploit '…the life sciences to make the individual warfighter stronger, more alert, more endurant, and better able to heal.'[65]All military technology, throughout history, has had the goal of making the warfighter, whether he/she be in a plane, on the battlefield or under the sea, more effective, that is more capable of accomplishing the tasks necessary to compete and win military engagements. Thus, improved weapons systems, communications systems, uniforms, logistical capabilities (cleaner water, hot food etc.) and even propaganda have been designed with the enemy and the environment in mind. The *raison d'être*, 'if it saves American lives, do it!' is of particular relevance here. In a sense, then, human enhancement is nothing new. Its contemporary and future applications, however, are of significant interest.

> …there have been rapid advances in areas of medical intervention for stroke recovery, spinal cord repair, development of prosthetics and neural interfaces for tetraplegics. In the realm of psychiatric medicine, there have been developments of psychopharmaceuticals and brain stimulation for treatment of serious illnesses such as post-traumatic stress disorder, depression, Alzheimer's disease and Parkinson's disease. In behavior and cognition, there have been advances in understanding the brain-basis for human responses, mechanisms of cognition, and the design of effective training approaches…

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[64] Ratner, *Nanotechnology and Homeland Security, ibid.* p. 28; Patrick Lin, Fritz Allhoff, 'Nanoscience and Nanoethics: Defining the Disciplines.' *in* Allhoff e*d*, *Nanoethics, ibid*.

> As an example of biology inspiring engineering, scientists are creating artificial noses with nanosized sensors which can accurately 'sniff' out smells that are otherwise imperceptible to humans (Nanmix, 2006). Similar work has been done to create artificial compound eyes (Jeong, 2006), borrowing from nature's design of insect eyes, as well as artificial skin (Maheshwari and Saraf, 2006) using nanomaterials to mimic the sensitivity of touch. p.7.

[65] House Armed Services Committee. 'Statement by Dr. Tony Tether, Director Defense Advanced Research Projects Agency, before the Subcommittee on Terrorism, Unconventional Threats, and Capabilities House Armed Services Committee, United States House of Representatives,' March 27, 2003 *as cited in* Jonathan D. Moreno, *Mind Wars, Brain Research and National Defense*, *ibid.* p.11.

> [There are]…two broad areas where there are significant, and highly publicized, advances in human modification. These are the areas of brain plasticity (permanently changing the function of an individual's brain, either by training or by pharmaceuticals), and the area of brain-computer interface (augmenting normal performance via an external devise directly linked to the nervous system.[66]

A short list of contemporary and envisioned human enhancements makes the point. Controlling fatigue and the poor decisions made as a result of sleep deprivation through pharmaceuticals; creating superior physical and psychological performance by controlling energy metabolism on demand (example: creating continuous peak performance and cognitive function for 3 to 5 days, 24 hours per day, without the need for calories); improving cognitive capacity through gene and proteomic medicine, emplacement of brain prostheses and training; controlling emotions such a fear and guilt through pharmaceuticals and gene therapy; emplacement of mechanical sensors and processors into the human body; and erasing bad memories through pharmaceuticals and electrical or magnetic stimulation; these, and a wide range of other examples, speak to what might be called *game-changing* technologies.[67]

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[66] JASON, The MITRE Corporation, *Human Performance*, JSR-07-625, Study performed on behalf of the Office of Defense Research and Engineering, Project no. 13079022, March, 2008.pp.12-13.

[67] Moreno, *Mind Games, ibid*. pp.116-132.; The President's Council on Bioethics notes a number of complications with the discipline:

> [T]he first complication is the fact that means and ends are readily detached from one another…Biotechnology, like any other technology, is not for anything in particular. Like any other technology, the goals it serves are supplied neither by the techniques themselves nor by the powers they make available, but by their human users. Like any other means, a given biotechnology once developed to serve one purpose is frequently available to serve multiple purposes, including some that were not imagined or even imaginable by those who brought the means into being.
>
> Second, there are several questions regarding the overall goal of biotechnology: improving the lot of humankind. What exactly is it about the lot of humankind that needs or invites improvement.
>
> Third, even assuming that we could agree on which aspects of the human condition call for improvement, we would still face difficulties deciding how to judge whether our attempts at improving them really made things better-both for the individual and for society.

Robotics enjoys preeminence in the discussion of military technologies, perhaps, because popular culture has served to inform the public of their possibilities[68] and, further, it may be said that their applications are easier to comprehend. Robots are defined as

> …[M]achines that are built upon what researchers call the 'sense-think-act' paradigm. That is, they are man-made devices with three key components: 'sensors' that monitor the environment and detect changes in it, 'processors' or 'artificial intelligence' that decides how to respond, and 'effectors' that act on the environment in a manner that reflects the decisions, creating some sort of change in the world around a robot. When these three parts act together, a robot gains the functionality of an artificial organism.[69]

The President's Council on Bioethics, 'Beyond Therapy: Biotechnology and the Pursuit of Happiness,' October, 2003, *retrieved at* http://bioethicsprint.bioethics.gov/reports/beyondtherapy/chapter=1.html, 11/10/2009.

[68] *The Terminator*, *Matrix* and *Star Trek* and its sequels, amongst many others, all employ robots as central characters and purport to wrestle with the ethical dilemmas of their use. Isaac Azimov is credited with creating the Three Laws of Robotics, later adding a fourth, and the first use of the term r*obotics*. Although certainly fictional and well over fifty years old (1950), they continue to be the natural starting point for all discussion regarding ethics and robots.

> Law Zero: A robot may not injure humanity, or, through inaction, allow humanity to come to harm.
>
> Law One: A robot may not injure a human being, or, through inaction, allow a human being to come to harm, unless this would violate a higher order law.
>
> Law Two: A robot must obey orders given it by human beings, except where such orders would conflict with a higher order law.
>
> Law Three: A robot must protect its own existence as long as such protection does not conflict with a higher order law.

Robotics Research Group, 'Learn More/History,' Univ. of Texas/Austin. p. 1, *retrieved at* http://www.robotics.utexas.edu/rrg/learn_more /history/ , 11/29/2009; Singer, *Wired for War, ibid*. pp. 150-170.

[69] Singer, *Wired For War, id*, p.67.

Robots are deployed to perform a wide range of tasks on and off the battlefield[70] and Congress has mandated that their use expand radically in the next decade.[71]Further, their development has increased as the needs have been identified. The Department of Defense reports that its investment in the technology has seen 'unmanned systems transformed from being primarily remote-operated, single-mission platforms into increasingly autonomous, multi-purpose systems. The fielding of increasingly sophisticated reconnaissance, targeting, and weapons delivery technology has not only allowed unmanned systems to participate in shortening the 'sensor to shooter' kill chain, but it has also allowed them to complete the chain by delivering precision weapons on target.[72] In other words *autonomous*[73] robots are being used to kill

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[70] Department of Defense reports that

> In today's military, unmanned systems are highly desired by combatant commanders (COGOMs) for their versatility and persistence. By performing tasks such as surveillance; signals intelligence (SIGNIT), precision target designation, mine detection; and chemical, biological, radiological, nuclear (CBRN) reconnaissance, unmanned systems have made key contributions to the Global War on Terror (GWOT). As of October 2008, coalition unmanned aircraft systems (UAS) (exclusive of hand-launched systems) have flown almost 500,000 flight hours in support of Operations Enduring Freedom and Iraqi Freedom, unmanned ground vehicles (UGVs) have conducted over 30,000 missions, detecting and/or neutralizing over 15,000 improvised explosive devices (IEDs), and unmanned maritime systems (UMSs) have provided security to ports.

Department of Defense*, FY2009-2034 Unmanned Systems Integrated Roadmap, ibid.* p.xiii.

[71] Section 220 of the FY Defense Authorization Act (H.R. 4205/P.L. 106-398 of October, 2000) states 'It shall be a goal of the Armed Forces to achieve the fielding of unmanned, remotely controlled technology such that –(1) by 2010, one-third of the aircraft in the operational deep strike force aircraft fleet are unmanned; and (2) by 2015, one-third of the operational ground combat vehicles are unmanned.' Ronald O'Roarke, 'Unmanned Vehicles for U.S. Naval Forces: Background and Issues for Congress,' *CRS Report for Congress*, *updated* April 12, 2007. p.1. According to Krishnan, there are currently more than 11,000 robots being utilized in the U.S. Military (as of 2009). Krishnan, *Killer Robots, ibid.* p.2. Singer reports that '[B]y the end of 2007, a United Nations report found that there were 4.1 million robots around the world working in people's homes (as vacuum cleaners and the like). That is, there were more robots than the entire human population of Ireland…' In addition, he notes that there are 4500 drones doing crop-dusting in Japan and providing security services to merchants. Assembly-line factory robotics is an $8 billion a year industry and growing rapidly. Singer, *Wired for War, ibid.* p.7-8.

[72] Department of Defense, FY*2009-2034 Unmanned Systems Integrated Roadmap*, *ibid*. p. xiii.

enemies on the battlefield, based on information received by their sensor and decisions made in their processors.

In the future, robotists tell us that it is probable that robots, with the addition of artificial intelligence (AI),[74] will be capable of acting independently, that is without human supervision-called *humans in the loop*-in the accomplishment of most tasks presently performed by soldiers today. Their sensors will be more capable of reading the environment than humans; their processors will, like a personal computer today, have available a wider range of information/experience and be able to consider it more rapidly than humans; and their effectors will not be constrained by human frailties of fear, fatigue, size and reaction to stress. They will be capable of their own creation (fabrication) and maintenance. Indeed, some believe they will free humans from participation in warfare altogether.[75]

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[73] The question of autonomy has and will have multiple ethical and legal ramifications in the future.

> 'The Oxford Dictionary defines autonomous as 'self-governing or independent' whereas the Merriam-Webster Dictionary defines it as 'existing or capable of existing independently' and 'responding, reacting, or developing independently of the whole.' For purposes of this paper, I am defining autonomous weapons (AW) as weapons capable of accomplishing a mission with limited or no human intervention. These systems are capable of self-propulsion, independent processing of the environment, and independent response to the environment.

Guetlein, 'Lethal Autonomous Weapons,' *ibid.* p.2.

[74] One definition defines *AI* as 'the science of making machines do things that would require intelligence if done by men.' Marvin Minsky, *Semantic Information Processing*. MIT Press: Cambridge, Ma: 1968, *as cited in* Krishnan, *Killer Robots, ibid*, p.47.

> First, robots will engage in lethal activities like mine clearing or I.E.D. detection (This is happening today). Then you'll see them accompany human combat units as augmenters and enablers on real battle fields. (This is beginning to happen). As robotics gets more and more sophisticated, they will take up potentially lethal but non combat operations like patrolling camp perimeters or no fly areas, and open fire only when 'provoked.' (This is beginning to happen too). The final state will be when robotic weapons are an integral part of the battlefield, just like 'normal' human controlled machines are today and make autonomous or near autonomous combat decisions.'

R. Mohan, 'Robotics and the Future of Warfare', 2007 *as cited in* Krishnan, id. p.34.

[75] Krishnan describes the dilemma of the truly autonomous robot soldier by referring to a science fiction story by Algis Budrys, 'First to Serve' written in 1954.

Non-lethal weapons technologies span a wide array of disciplines and attempt to address the modern dilemma of security forces (police, soldiers, and soldiers acting as constabulary) who in dealing with entrenched and unruly adversaries of various kinds are often left with the Hobson's choice of projecting too little or too much force.[76] They attempt to address modern concerns regarding the interaction of state security forces and the public which are reflected in increased scrutiny of their activities, public diplomacy issues and ever-increasing humanitarian law concerns regarding proportionality and use of force generally. A fairly comprehensive definition speaks to their intentions rather than specifying specific technologies.

> 3.1 Non-Lethal Weapons. Weapons that are explicitly designed and primarily employed so as to incapacitate personnel or materiel, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment.

> In the story the Pentagon wants to build a robot soldier that is smarter and tougher than a human soldier. A Pentagon research laboratory actually manages to create such an ideal robot soldier. The dilemma is that the robot mimics human beings too perfectly, even to the degree that is shows individuality and self-awareness. This turns out to be an undesirable feature because a robot that is smarter than its human military commanders might eventually reject stupid orders from a less intelligent, less competent human being. Making the robot more like an automaton than a human, however, will only make it slow, stupid and cumbersome. In other words, it would lose its military value, as it would no longer possess the autonomy and ingenuity to do its job to the standard for which it was created.

Krishnan, *Killer Robots, ibid.* p. 58 and 2. Krishnan cites the DARPA vision regarding the elimination of humans from the battlefield, articulated as early as 1983.

> Instead of fielding simple guided missiles or remote piloted vehicles, we might launch completely autonomous land, sea, and air vehicles capable of complex, far-ranging reconnaissance and attack missions…Using this new technology [of artificial intelligence], machines will perform complex tasks with little human intervention, or even with complete autonomy…The possibilities are quite startling, and could fundamentally change the nature of human conflicts. p.24.

[76] Koplow, *Non-Lethal Weapons, ibid.* pp. 1-2.

3.2 Unlike conventional lethal weapons that destroy their targets principally through blast, penetration and fragmentation, non-lethal weapons employ means other than gross physical destruction to prevent the target from function.

3.3 Non-lethal weapons are intended to have one, or both of the following characteristics:

3.1.2.1 They have relatively reversible effects on personnel or materiel.

3.1.2.2 They affect objects differently within their area of influence.[77]

Again, the technologies themselves do not define the category but rather their capabilities (constraints?) and their intention of use. Examples include sticky and slippery foam, various types of electric guns, often referred to in part as Tasers, Pepper Spray, Acoustic Rays, Directed Energy Heat Rays, Chemical Calmatives or Malodorants, Projectile Netting, Anitmateriel Biological and Chemical Agents and other miscellaneous Non-Lethal Weapons such as electromagnetic pulse devises for disabling electrical systems, flash-bang and stinger grenades and low-kinetic-energy bullets.[78]There has been a good deal of uneasiness regarding defining these technologies as somehow separate and distinct from other forms of weapons systems inasmuch as all technologies are capable of lethality if improperly used.[79]

Information technology, informed by nanoscience, has created the most immediate change on the battlefield to date. Applications of emerging micro-chip-based technologies, especially advanced computers and communications systems, make it easier to find, target with precision and kill the enemy with *smart* technology.[80] Information technology, further, provides the

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[77] Department of Defense Directive No. 3000.3, *Policy for Non-Lethal Weapons,* July 9, 1996.

[78] Koplow, *Non-Lethal Weapons, ibid.* pp.14-28.

[79] *See generally*, Neil Davison '*Non-Lethal' Weapons.* Palgrave Macmillan: New York, 2009. pp.1-10. 'Paradoxically, despite increased research and development during the past 15 years, few 'non-lethal' weapons incorporating new technologies have actually been deployed on a large scale.' p. 9; Cheryl Welsh, '2006 Government Mind Control Debate,' *Mind Justice,* 2006.

[80] Precision Guided Missiles (PGMs) were highly touted as a means to increase lethality while at the same time decreasing collateral damage, specifically civilian casualties.

> The accuracy of PGM(s) promises to give us a very different age: perhaps a more humane one. It is odd to speak favorably about the moral character of a weapon, but the image of a Tomahawk missile slamming precisely into its target when contrasted with the strategic bombardments of World war 11 does in fact contain a deep moral message and meaning. War may well be a ubiquitous part of the human condition, but war's

soldier on the battlefield with real world information through the use of digital screens located in helmets, etc. which pinpoint location of all individuals and make it possible for each soldier, and especially leaders, to communicate rapidly and effectively based on up to date information. The fog of war-that confusion, which has permeated the battlefield from the inception of warfare, can be lifted, or at the very least, managed.[81]

OF CONSUMERS AND INNOVATORS

The research and development (R&D) of technology for military use, *cooption*, i*nnovation* and *application*, is big ; that is, it influences considerably the budget process, the relationship between the private and public sector, the relationship between institutions within the public sector, the economy generally, and relations between actors on the international stage. Exact numbers regarding government spending are difficult to get at due to the increasingly sophisticated-and confusing-manner in which they are reported and the fact that a fairly substantial portion of the investment by governments is classified. Further, technology innovation is often *dual-use*, that is, being performed by a wide range of civilian and military institutions, including research universities, commercial laboratories, government facilities and Individuals working in private facilities. Finally, since World War 11, innovation culture has changed radically producing what Philip Scranton has called *technological uncertainty*.[82]

Scranton explains that perceived emergent requirements as a result of a number of socio-political factors[83] caused two shifts in the way innovation culture organized.

> permanence does not necessarily mean that the slaughters of the twentieth century are permanent.

George and Meredith Friedman, *The Future of War,* 1996 *as cited in* Dunlap, 'Technology and the 21st Century Battlefield,' *ibid.* p.2.

[81] Dependence on information technology has had its critics of recent years, especially since the day to day slug fest in the streets of Bagdad has reinforced traditional requirements for the individual skills of soldiers on the ground to combat the asymmetric tactics of Iraqi militias during stability operations. Schachtman, 'How Technology Almost Lost the War,' *ibid.* p. 8.

[82] Philip Scranton, 'The Challenge of Technological Uncertainty,' *Technology and Culture*, v. 50, no. 2, April 2009, *retrieved at* http://muse.jhu.edu.proxy.libraries.rutgers.edu/journals.technology_and_culture/v050/50...11/20/2009

[83] These include

> …the establishment of a bipolar, global, poltico-technical competition; the creation in the United States of a large, permanent standing army, fed by a restored draft [now a restored reserve force]; the parallel implantation of a permanent international intelligence arm of the executive branch; and the

> The first shift during the cold war affected a number of industrial fields where urgent demand, funded by rival military establishments, propelled what I'm calling experimental development of highly complex, yet workable devices-despite insufficient usable or relevant science…Second, a pattern of continuous innovation along many of these trajectories [metallurgy, fluid dynamics, combustion etc.] entailed that design changes multiplied and user expectations altered at rapid rates. This meant that no technologically stable platform could be realized so that iterations of use could squeeze out faults and allow remediation. In essence, continuous redesign in the context of incomplete (or underdeveloped) science created durable or, in Karl Weick's terms, 'permanent' technological uncertainties. Neither military nor commercial rivalry permitted a freezing of designs that in turn could allow learning from failures to generate deep knowledgeability and condition a technological stabilization, as seems to have happened so often in earlier generations. In consequence, stochastic failures followed redesigns in irregular order.[84]

These shifts have informed the environment in which innovation occurs today. First, both cost expectations and planned schedules for development and delivery regularly prove unreliable. Constant complaints regarding *fraud, waste and abuse* in the procurement system, while often justified, often occur as a result of a built-in dilemma regarding the manner in which innovation is produced-'…getting a novel device on time and on budget could easily mean getting a devise that lacked innovation, was obsolescent at first use, worked unreliably, or all three.'[85] Second constant redesign plays havoc with the management of logistics, maintenance and supply. Third, redesign and operational technological uncertainty constrains operational deployment of military technologies because user's training and experience is routinely degraded by the introduction of new redesigns and fixes to apparent problems, and entire units, configured on the basis of the use of particular technologies are rendered non-deployable as a result of redesigns and fixes. Fourth, a good degree of what Scranton refers to as *political uncertainty* results, in that rumor of new developments has had a way of affecting the internal politics of the services as they fight for mission dollars and relevance. Further, political wrangling regarding the entire process, it's constant morphing from support for one program and then

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> U.S. military's increasing fascination with and embrace of technological innovations for warfare.

Scranton, *id.* p.2.

[84] Scranton, i*d*. p.3.

[85] Scranton*, id.* p. 4.

the next and the various interest groups poised always to take advantage of the *next big thing* contributes to an inability to see confidently into the future and plan accordingly.[86]Finally, perhaps most important for the purposes of this discussion, the rapidity of innovation curtails analysis of the intended and unintended consequences which may occur. The *genie* is loosed on the world without study or reflection, certain only in the uncertainty of his coming.

This competition is of a particular stripe as well. Before the end of the cold war, it has been argued, the nature of arms races between the super powers, Britain, France and Germany, the U.S. and the U.S.S.R., were primarily q*uantitative*-that is, everybody pretty much had the same weapons, (dreadnoughts, tanks, aircraft carriers, bombers, nuclear warheads), the question was how many were operational in the various arsenals. Since the end of the cold war, however, the competition is more about new technology, *qualitative* superiority, and the competition includes a race to outspend others.[87]Further, innovation speaks not only to creating offensive weapons-first use-but also combating technologies created by others. Thus, one argues, even if a state forgoes the use of a particular weapon, a particular virus for example, it must continue its research in order to defend against another state that may-or may not-be so inclined.[88]Finally, the intersection between bureaucracies, civilian institutions, and individuals, all competing for R&D dollars, contributes to arms races in and of itself.

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[86] Scranton, i*d.*p.4.

[87] Alia Lamaadar, 'War and Peace From Weapons Technology: Examining the Validity of Optimistic/Semi-Optimistic Technological Determinism.' *The McGill Journal of Political Studies,* 2003/04. p. 5.

[88] DARPA emphasizes research in nine strategic areas, one of which is referred to as *bio-revolution*.

> Developing defenses against biological attack poses daunting problems. Strategies using today's technologies are seriously limited. First, it is nearly impossible to predict what threats might emerge in two decades, particularly engineered threats. Second, from the moment a new pathogen is first identified-either a weapons agent or a naturally emerging pathogen-today's technology requires at least 15 years to discover, develop, and manufacture large quantities of an effective therapy…
>
> DARPA's programs have begun to transition technologies to U.S. Government agencies and commercial industries that will enable vaccine discovery to potentially occur orders-of-magnitude faster than we can make happen today, and in population-significant quantities.

Depart of Defense, 'Defense Advanced Research Projects Agency, Strategy Plan,' May, 2009. pp. 37 and 39.

> [I]t is often internal technological forces which drive arms races. The impulse to technological competition stems from the very size, expansion and goal setting of military research and development. Unlike any time period before it, modern warfare invades all scientific disciplines and environments-land, sea, deep-sea, space, jungles, desserts and even cyber-environments-a pervasiveness which dictates that hundreds of thousands of scientists and engineers working on parallel problems, should be competing among themselves in the invention, development and perfection of new arms and weapon systems. The internal arms race is further sustained through the selective allocation of funds granted to military research and development, as well as the structured rivalry between the different military services (army, navy, and air force) and various independent laboratories. These mechanisms ensure sustained internal competition which dictates optimum weapons efficiency, dramatic results, an immutable drive to continue and the fuel for other nations to rationalize their own internal competition. [89]

Nor is all this innovation cheap. Some numbers, while hardly exact (another consequence of *technological uncertainty*?) are instructive. The United States Defense budget request for FY 2010 is in the area of $3.6 trillion. R&D spending is well over $78.6 billion. This does not include R&D spending which is classified, nor does it include R&D spending by other agencies which impact on military innovation. [90]China's research and development spending since 1995 has increased at an annual rate of 19% to reach $30 billion in 2005, the best figure that the Department of Defense could provide in its report to Congress in 2009. Given the continued

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[89] Lamaadar, War or Peace From Weapons Technology, ibid. p.5. Lamaadar reminds us of President Eisenhower's 1961 Farewell address:

> This conjuncture of an immense military establishment and a large arms industry is now in the American experience. The total influence-economic, political, even spiritual-is felt in every city, every State House, every office of the Federal Government….We must guard against the acquisition of unwarranted influence, whether sought or unsought, by the military industrial complex. The potential for the disastrous rise of misplaced power exists and will persist.

Farewell Address of President Dwight D. Eisenhower, January, 1961, *cited id,* p.5.

[90] Patrick J. Clements, 'Research and Development in the FY 2010 Defense Budget' *Budget Insight, Stimson Center Blog*, November 3, 2009 *retrieved at* http://budgetinsight.wordpress.com/2009/11/03/research-and-development-in-the-fy-2010-defense-budget/, 11/20/2009.

economic growth of China in the interim, the lack of transparency regarding Chinese budgetary matters, and the labyrinth of intersecting private and public sector institutions, this figure must be assumed to be much higher. [91]

Finally, there is the issue of the government's role in innovation. While a good deal of the technological innovation which finds its way into military use comes from the civilian sector as either duel use technology or technology which is adapted after the fact for military use, there is a fairly pervasive government footprint as well. There are multiple research projects of various sizes and charters which concern themselves with the short term-requirements based needs of commanders on the battlefield throughout DOD. Sitting above these is DARPA, an organization of approximately 150 individuals who are solely concerned with *radical innovation for national security.*[92] Born of the paranoia which surrounded the Soviet Union's Sputnik operation in space in 1957, DARPA's mission is 'to prevent technological surprise for us and to create technological surprise for our adversaries.[93] It is the first to recognize that

> '[N]one of the most important weapons transforming warfare in the 20th century-the airplane, tank, radar, jet engine, helicopter, electronic computer, net even the atomic bomb-owed its initial development to a doctrinal requirement or request from the military.' *None* of them. DARPA would add to this list unmanned systems, stealth, and the global positioning system (GPS), which was preceded by a DARPA system called Transit, and Internet technologies.[94]

DARPA looks well beyond commander's requirement in most cases and emphasizes research… 'the Services are unlikely to support because it is risky, does not fit their specific role or missions, or challenges existing systems or operational concepts.'[95] DARPA receives approximately 25% of the DOD Science and Technology budget (almost $14 billion). Thus DARPA's funding (approximately $2 billion) goes to 'new ideas, products, and markets' while the remainder of the DOD Science and Technology budget is devoted to product improvement and near-term requirements based projects.[96] The majority of DARPA investments

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[91] Office of the Secretary of Defense, 'Annual Report to Congress.' *Ibid*. pp. 31-35.

[92] *Id.* p.1.

[93] *Id.*

[94] *Id.* p. 3, *quoting* John Chambers, *ed., The Oxford Companion to American Military History*. Oxford Univ. Press: 1999. p.791.

[95] I*d*. p.5.

[96] *Id*. p.6.

(approximately 98%) go to organizations outside DARPA, primarily universities and industries. The purpose is to abet the outside institution's effort to create a technological innovation in which it becomes sufficiently comfortable to invest its own money as it goes forward to propose it to a DOD user. DARPA employees are not career bureaucrats but move in and out of industry and academia during the course of a career. DARPA believes this fosters a culture of collegiality and innovation without the constraints of parochialism normally associated with the decentralized innovation organization of the agencies.[97] Its culture, then, is to free itself of all constraints in order to insure its ability to find *the next best thing*-radical innovation for national security.

All of this has occurred in a political environment which explains, some would argue mandates, the need for rapid innovation. Since World War 11, the Korean War, and especially Vietnam, the American public has eschewed the concept of mandatory public service, has underwritten an expensive volunteer force for this purpose and has demonstrated very little interest in participating in foreign policy projects led by the military. Demographically, the pool of volunteers is dwindling and there is a perceived belief-acted on by politicians generally-that the public has no tolerance for death and maiming on the battlefield-either side- no matter what the cause.[98] Technology has been and will continue to be proposed as the *fix* for these conditions.[99]

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[97] William Bonvillian, 'Power Play, The DARPA Model and U.S. Energy Policy,' *Holidays,* November/December, 2006. p. 43.

[98]David Halberstam, *War in A time of Peace: Bush, Clinton and the Generals.* Simon & *Schuster: New York, 2001.*

[99] Peter W. Singer, HOW TO BE ALL THAT YOU CAN BE: A LOOK AT THE PENTAGON'S FIVE STEP PLAN FOR MAKING I*RON MAN* REAL, Brookings, November 17, 2009. P.8-9, *quoting* Friedman, *The Future of War*, *ibid*. p. 392, *retrieved at* http://www.brookings.edu/articles/2008/0502_singer.aspx, 11/17/2009.

> If individual soldiers are now instead packing the firepower and mobility of a tank or more, a literal' Army of One' as the U.S. Army recruiting commercials used to claim, it is hard to see them being used and deployed as they were in the past. Instead of being bundled together in large units on the battlefield, the regular infantry would likely operate in very small units or even alone. Marine Lieutenant General James Amos describes that soldiers serving in tiny squads, commanded by a sergeant or lieutenant, could hold down hostile cities of 100,000 or more…
>
> Having small units packing such punch would also change the way a nation mobilizes for war. Fewer soldiers would seem to be needed for the same task and a nation with technologically super-empowered soldiers might make it easier to strike quickly or covertly. If there were smaller numbers of troops in the field, it

This environment, then, is driven by multiple factors from the top and the bottom. It is generally decentralized but funded in one form or another by massive amounts of money from the central government, which is itself driven by the need to place technology of all kinds between itself and the people it serves. The system is vast, unorganized, and like many aspects of the globalized 21st century, ungoverned and as yet ungovernable.

SOME CROSSROADS (ETHICAL DILLEMMAS?)

There is a good deal of literature regarding the intersection of ethics and technological innovation, and yet its review leads to the conclusion that as yet there is no overarching consensus (political will?) regarding the regulation of emerging technologies either in their innovation or their use.[100]There are multiple reasons for this failure of regulation including the

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would also eliminate the need for a huge logistical support structure. Ultimately, described one set of military analysts, 'What we are seeing is the end of the G.I. The G.I., the stamped government issue interchangeable warrior, becomes obsolete when masses of men are no longer required to fight wars.

But see, Schachtman, 'How Technology Almost Lost the War,' *ibid.*

[100] Moreno, *Mind Wars*, *ibid*. Koplow, *Nanotechnology and Homeland Security, ibid*; Krishnan, *Killer robots, ibid*; Singer, *Wired For War, ibid;* Lin, *Robots in War, ibid*; Boot, *War Made New, ibid*; Murray, 'War and the West,' *ibid*; Guston, 'Anticipating the Ethical and Political Changes of Human Nanotechnologies,' *ibid;* Allhoff. *ed. Nanotechnology*, *ibid*; Joy, 'Why the Future Doesn't Need Us,' *ibid*; Altman*, Military Nanotechnology, Potential Applications and Preventive Arms Control, ibid*; Frida Kuhlau, Stefan Eriksson, Kathinka Evers, 'Taking Due Care: Moral Obligations in Dual Use Research. *Bioethics* v. 22 no.9, November 2008, p. 477-87; Inmaculafda de Melo-Martin, 'Chimeras and Human Dignity,' *Kennedy Institute of Ethics Journal* vo. 18 no. 4, December 2008; Barry Bozeman, Catherine Slade, Paul Hirsch, 'Understanding Bureaucracy in Health Science Ethics: Toward a Better Institutional Review Board,' *American Journal of Public Health 99*, no. 9, S 2009, pp. 1549-56; Antonio Marturano, 'When Speed Truly Matters, Openness is the Answer,' *Bioethics* v. 23 no. 7 September, 2009, pp. 385-93; Antonio G. Spagnolo, 'Outlining Ethical Issues in Nanotechnologies,' *Bioethics* v. 23, no.7, September 2009, pp. 394-402; 'Should We Enhance Animals?' *Journal of Medical Ethics* v. 35 no. 11 November 2009. pp. 678-83; Nick Lewer, 'Nonlethal Weapons,' *Forum for Applied Research and Public Policy*, v. 14 no. 2 Summer 1999. pp. 39-45; Steven Bernstein, Jennifer Clapp, Mathew Hoffmann, 'Reframing Global Environmental Governance, Results of a CIGI/CIS Collaboration,' *The Center for International Governance Innovation*, Working Paper no. 45, December, 2009; Susan Cozzens, 'Emerging Technologies and Inequalities: Beyond the Technological Transition' Draft Comments, *Technology, Policy and Assessment Center,* School of Public Policy, Georgia Institute of Technology, April 5, 2009; Robert A. Pielke, Jr. *The Honest Broker, Making Sense of Security Policy and Politic*s. Cambridge Univ. Press: Cambridge, 2000; Eurgen B. Skolnikoff, *The Elusive Transformation: Science, Technology, and the Evolution of International Politics*.

competitive environment in which innovation occurs generally (political, social, economic, and bureaucratic); the cultural imperatives of western, and now global, culture; the fragmentation

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Princeton University Press: Princeton, 1993; Francis Fukuyama, Our Posthuman Future, Consequences of the Biotechnology Revolution. Pacador: New York, 2002; Barton C. Hacker, *American Military Technology, the Life story of a Technology*. Johns Hopkins Univ. Press: Baltimore, 2006; Simon Young, *designer evolution, a transhumnist manifesto.* Prometheus Books: Amherst, New York, 2006;Mathew J. Skeerov, 'Solving the Dilemma of State Response to Cyberattacks: A Justification for the Use of Active Defenses Against States Who Neglect Their Duty to Prevent.' *Military Law Review*, v. 201, Fall, 2009; Ray Kurzweil, *The Singularity is Near, When Humans Transcend Biology*. Penguin Books: New York, 2005. Mark Gruber speaks specifically to the issue of failure of regulation on the stability of the international system:

> The greatest danger coincides with the emergence of these powerful technologies: A quickening succession of 'revolutions' may spark new arms races involving a number of potential competitors. Older systems, including nuclear weapons, would become vulnerable to novel forms of attack or neutralization. Rapidly evolving, untested, secret, and even 'virtual' arsenals would undermine confidence in the ability to retaliate or resist aggression. Warning and decision times would shrink. Covert infiltration of intelligence and sabotage devices would blur the distinction between confrontation and war. Overt deployment of ultramodern weapons, perhaps on a massive scale, would alarm technological laggards. Actual and perceived power balances would shift dramatically and abruptly. Accompanied by economic upheaval, general uncertainty and disputes over the future of major resources and of humanity itself, such a runaway crisis would likely erupt into large-scale rearmament and warfare well before another technological plateau was reached.
>
> International regimes combining arms control, verification and transparency, collective security and limited military capabilities, can be proposed in order to maintain stability. However, these would require unprecedented levels of cooperation and restraint, and would be prone to collapse if nations persist in challenging each other with threats of force. If we believe that assemblers are feasible, perhaps the most important implication is this: Ultimately, we will need an integrated international security system. For the present, failure to consider alternatives to unilateral 'peace through strength' puts us on a course toward the next world war.

Mark Gruber, remarks in 1977 before the *Foresight Institute as cited in* Daniel Moore, 'Nanotechnology and the Military' *in* Allhoff, *ed. Nanoethics, ibid.* pp. 271-72.

of what can be termed *centers of regulation*, RCs,[101] (the state, professional organizations, religion, international legal regimes, ngos, gangs etc.); and the perceived defensive need to balance technologies created by other state and non-state actors. These forces have been alluded to above and, in a sense, are not new. The rapidity of technological advancement in an environment of *technological uncertainty*, however, may be new.

For the military, the imperatives are somewhat different. Ensconced firmly in the duties and responsibilities of the Westphalian system, the military's purpose is, and will continue to be for the foreseeable future, defense of the state against all enemies '…foreign and domestic.' [102] *Applicatio*n and *use* of emerging technologies, here, are practiced for very specific and often emergent reasons. There is a tension between experimentation, and the failures that often

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[101] While the term *RC* is the author's, it reflects the increasing recognition that civil authority-regulation of conduct ethical and otherwise-flows from many sources, not merely the state. Social scientists have made this point for decades. James N. Rosenau calls them *spheres of authority* and explains:

> [The world is not so much a system dominated by states and national governments as a congeries of spheres of authority (SOAs) that are subject to considerable flux and not necessarily coterminous with the division of territorial space. SOAs are, in effect, the analytic units of the ontology. They are distinguished by the presence of actors who can evoke compliance when exercising authority as they engage in activities that delineate the sphere. The sphere may or may not correspond to a bounded territory: those who comply may be spread around the world and have no legal relationship to one another, or they may be located in the same geographic space and have the same organizational affiliations.

James N. Rosenau, *Along The Domestic-Foreign Frontier: Exploring Governance in a Turbulent World*. Cambridge Univ. Press: Cambridge, 1997. p.39.

[102] The United States Military Oath of Office reads as follows:

> I, (NAME), do solemnly swear (or affirm) that I will support and defend the Constitution of the United States against all enemies, foreign and domestic; that I will bear true faith and allegiance to the same; and that I will obey the orders of the President of the United States and the orders of officers appointed over me, according to regulations and the Uniform Code of Military Justice. So help me God

Article 1 of the Code of Conduct requires each member of the military to recognize and commit to the following: 'I am an American, fighting in the forces which guard my country and our way of life. I am prepared to give my life in their defense.' *retrieved at* http://usmilitary:about.com/od/justicelawlegislation/a/codeofconduct1.htm, 11/26/2009.

accompany it (which are generally unacceptable) and fielding as quickly as possible the most efficient methodologies in order to complete military missions. Further, military culture is, one could argue of necessity, communal in nature; morale, discipline and, indeed, efficiency revolve around adherence and loyalty to communal values and bonds of comradeship.[103] Hence, the tendency towards 'us and them' and 'if it saves American lives, do it!'

[103] Keegan's review of the history of warfare makes this point eloquently:

> Soldiers are not as other men-that is the lesson that I have learned from a life cast among warriors. The lesson has taught me to view with extreme suspicion all theories and representations of war that equate it with any other activity in human affairs. War undoubtedly connects, as theorists demonstrate, with economics and diplomacy and politics. Connection does not amount to identity or even to similarity. War is wholly unlike diplomacy or politics because it must be fought by men whose values and skills are not those of politicians or diplomats. They are those of a world apart, a very ancient world, which exists in parallel with the everyday world but does not belong to it. Both worlds change over time and the warrior world adapts in step to the civilian. It follows it, however, at a distance. The distance can never be closed, for the culture of the warrior can never be that of civilization itself. All civilizations owe their origins to the warrior; their cultures nuture the warriors who defend them and the differences between them will make those of one very different in externals from those of another. It is, indeed, a theme of this book that in externals there are three distinct warrior traditions. Ultimately, however, there is only one warrior culture. Its evolution and transformation over time and place, from man's beginnings to his arrival in the contemporary world, is the history of warfare.

Keegan, History of Warfare, *ibid.* p. xvi.

Innovation creates ethical dilemmas[104] on a daily basis for all who get wrapped up in it, from the promoter, to the funder, to the adapter, to the user. Military officers involved in the process of procurement and development are routinely required to *think outside the box,* that is envision needs for near and far term use and set the process of *innovation* and *adaption* in motion. Funders move between myriad possibilities as they attempt to determine which innovations are entitled to their attention and *push;* commanders wrestle with fielding and using technologies in order to accomplish their two responsibilities-accomplishing the mission and seeing to the safety of their soldiers; and users-those in the field-*adapt* innovation from the minute it is made available to them in multiple environments which often require split second decisions about the life and death of those around them. Further, this environment is considerably different than the one in which the ethical norms were created. Current operations are '…generally justified on moral principles and involve a multinational, joint and interagency deployment sent to intervene in an irregular, intrastate conflict occurring in an underdeveloped region and conducted under the intense glare of the media.'[105]

There is a tension, then. Emergent technologies provide *fixes* for users badly in need of them; they often make the difference between life and death for the user; and they make it possible for the user to accomplish the myriad tasks required of them by civil authorities. On the other

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[104] Ethics is a large subject, the multiple discussions of which are outside the scope of this paper. While the study of ethics, generally, deals with issues of *right* and *wrong*, *good* and *bad, moral* and *immoral* etc. the concept of military ethics serves very immediate and utilitarian goals given the environments in which it is practiced. One commentator puts it this way:

> Military ethics serve as a normative code of behavior for the armed forces of a state, acting as a mechanism of definition and control within the force, between the force and its client, and between the force, its adversaries and the wider public. They have two intrinsically linked functions: a preventative function, which defines the moral and legal parameters of conduct, and a constructive function, which creates and maintains an effective and controllable force...Despite the reduction in conflict intensity, the constructive function has a remaining utility through its mediation and amelioration of the stressors engendered by the growing complexity of the operational environment.

Mathew William Rout, 'To Define & Control: The Utility of Military Ethics in the New Zealand Army's Contemporary Operations Environment,' Master's Thesis, Univ. of Cantebury, 2009 *retrieved at* http://cantebury.ac.nz/handle/10092/3048, 11/26/2009.The U.S. Army spends a good deal of time teaching values, for example, and denominates loyalty, duty, respect, selfless service, honor, integrity, and personal courage as the seven core Army values which define 'what being a Soldier is all about.' Department of the Army, 'Soldier Life, Living the Army Values' *retrieved at* http://www.goarmy.com/life/living_the_army_values.jsp, 11/27/2009.

[105] Rout, 'To Define and Control.' *Id.*

hand, their efficacy is often untested which places users in precarious situations, their unintended consequences are realized in these same environments, and their immediate use often runs well ahead of the norms and practices upon which the military institution is based. Some examples of this tension are instructive.

What does it mean to be a warrior?

At least for the foreseeable future a soldier is a human being; one who enters *the profession* with values and ethics learned at his[106] mother's knee, during his formative years in civil society, and a sense of other moral systems such as religious beliefs etc. He is also capable of exhibiting what are generally accepted psychological traits of human beings including fear, love, anger, rage, guilt, mercy, hope, faith, generosity, courage, shame and cowardice etc. The warrior has traditionally been *enhanced* by training and technology to accomplish *the military function*, which, according to Samuel Huntington is performed …'by a public bureaucratized profession expert in the management of violence and responsible for the military security of the state.'[107] He is also a volunteer, or at least has agreed in one form or another to enter a special class of citizens, prepared to project violence on behalf of the state and committed to the knowledge that he may be targeted by others as a result of this commitment. The warrior culture and the warrior ethic which supports it have a number of characteristics which are relevant to the definition according to Huntington.

> The military ethic emphasizes the permanence, irrationality, weakness, and evil in human nature. It stresses the supremacy of society over the individual and the importance of order, hierarchy, and division of function. It stresses the continuity and value of history. It accepts the nation state as the highest form of political organization and recognizes the continuing likelihood of wars among nation states. It emphasizes the importance of power in international relations and warns of the dangers of state security. It holds that the security of the state depends upon the creation and maintenance of strong military forces. It urges the

[106] One must remember that the definition of the contemporary warrior is no longer gender specific, especially in the United States. Some 20% of the military force is comprised of women, including 14.2% active force, 24.1% Reserve force, and 14.1% National Guard, who have proven capable of accomplishing most, if not all, primary skills of soldiering. *Women in Military Service For America Memorial Foundation, Inc*. hg.womensmemorial.org. The use of the male gender here, then, is done for simplicity's sake *only* and should not be construed as an attempt by the author to enter in any way the discussion regarding the efficacy of female soldiers, a discussion which has been contentious and often poorly articulated.

[107] Samuel P. Huntington, *The Soldier and the State, The Theory and Politics of Civil-Military Relations.* The Belknap Press of Harvard Univ. Press: Cambridge, Ma, 1957. p.61.

> limitation of state action to the direct interests of the state, the restriction of extensive commitments, and the undesirability of bellicose and adventurous policies. It holds that war is the instrument of politics that the military are the servants of the statesman, and that civilian control is essential to military professionalism. It exalts obedience as the highest virtue of military men. The military ethic is thus pessimistic, collectivist, historically inclined, power-oriented, nationalistic, militaristic, pacifist, and instrumentalist in its view of the military profession. It is, in brief, realistic and conservative.[108]

Consistent with the past, the modern warrior respects actions of his peers which reflect *valor*, *loyalty,* and adherence to the military ethic, even under the most dire of circumstances. Because he is a realist and assumes human weakness and frailty-indeed, trains his whole life to overcome these characteristics in himself- actions which reflect these values provide *honor*, a much sought after commodity.[109] This ethic, it would appear, has two functions which are especially important given the environment he works in. The ethic helps him differentiate between the killing he is required to do and simple murder. He is constrained to project force only in certain restricted situations. If he complies, despite the circumstance, he is deemed *honorable*; otherwise he is a thug, a base murderer, rapist, sadist etc. The ethic, therefore, provides constraint. Second, it can help him justify the force he has used, which provides a useful psychological benefit, contributes to morale, and personal adherence to regulation.[110]The warrior is a representative of the state for which he fights. This system of constraints inures not only to him personally and the community in which he serves, but to the state itself.

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[108] *Id.* p.79. Regarding war itself, Huntington continues, '[H}e is afraid of war. He wants to prepare for war. But he is never ready to fight a war.' p.69.

[109] Walter Lippmann is often quoted in this regard, '[A] man has honor if he holds himself to an ideal of conduct though it is inconvenient, unprofitable, or dangerous to do so.' Walter Lippman, *retrieved at* http://thinkexist.com/common/print.asp?id=226812&quote=a_man_has_honor_if_he_hold... 11/30/2009.

[110] Shannon French, 'The Warrior's Code,' 2001. 'Before we call any collection of belligerents a culture of warriors, we should first ask why they fight, how they fight, what brings them honor, and what brings them shame,' *retrieved at* http://www.au.af.mil/au/awc/awcgate/jscope/french.htm, 11/26/2009; *See also*, Shannon French, *The Code of the Warrior: Exploring Warrior Values Past and Present.* Rowman & Littlefield Pub., Inc: Lanham, Md, 2005; John McCain, *Faith of My Fathers, A Family Memoir.* Harper Perennial: New York, 2000.

It can be argued that a system of bioenhansement, through nanotechnologies, prosthetics and/or pharmaceuticals, may well be capable of relieving the warrior of the frailties the warrior code is designed to guard against. Physical frailties can certainly be ameliorated. Further, the new soldier will no longer need to worry about fatigue, disease on the battlefield, and a whole host of other maladies which have plagued him for centuries. His *post-bellum* health concerns from psychological maladies to amputations and disfigurements can be cured as well through a vast menu of technologies. Gone will be anxieties traditionally connected with the enterprise of war, the fear, the pain, the imminence of death. Second-thoughts, guilt and shame, and pride can also be dissipated as can the need to question the projection of force in the first place. Gone too, it would appear, would be the necessity of personal achievement, the proverbial *thrill of victory and agony of defeat*. What difficulties there might be can be adjusted after the fact on an individual basis, no need for condolence or support from fellows, no identification with comrades, no concerns over valor, loyalty and honor. One is tempted to discount these conclusions as the romantic ravings of individuals who have forgotten-or never known-the horror of the battlefield; yet they would appear to be the logical extension of the progress towards making the entire project of war pain free in order to obtain optimal efficiency, in itself a worthy goal.

Robotics, in a sense, represents merely one more type of enhancement, albeit an enhancement so great that it may take the new soldier off the battlefield completely; especially if we are able to increase the independence of robots through artificial intelligence to the point where all tasks can be completed by them.[111]

The ethical dilemma, then, involves the question is it a good thing to make war a painless exercise akin to a video game or a week at a dude ranch? Is there some value to the warrior's code which is lost when the stakes are no longer high? Can we enhance the biological body to a point which is inconsistent with the definition of what it means to be human? And does this make any difference? In addition, issues of inequality are raised. Does every new soldier get the benefits of enhancement or only those deemed worthy through some sort of medical and means testing? Who gets to be an iron man, enhanced to the point of complete protection while others must continue to endure the vagaries of the battlefield? What of the intersection between these new iron men and civil society? If all new soldiers can be equally smart, equally

[111] At present autonomous weapons (AW) already provide considerable capabilities for the user over and above what the warrior can accomplish. Unmanned systems are one-third the cost of manned platforms and cost two-thirds as much to operate; they reduce the kill chain (find, fix, track, target, engage, assess) from hours to minutes; they can be prepositioned thereby reducing large logistics footprints; they are not mission specific, which is to say they can be used for a wide range of missions and in a wide range of operations from conventional warfare to peace-keeping to humanitarian relief; they are persistent, that is they can remain on target for extended periods of time; and can provide *post mortem* analysis through the use of accurate data; and they are capable of precision strikes. Guetlein, 'Lethal Autonomous Weapons.' *ibid*. pp.4-5.

brave, equally fit, and equally competent, what purpose will exist for the hierarchical nature of the institution, with its paternalism and emphasis on leadership? On what basis will authority rest? For civil authorities who must ponder their use of these new soldiers, will it be easier to start wars and continue the projection of force in the knowledge that there will be no body bags, minimal suffering, and long-term consequences for the body politic? Will this phenomenon continue to widen the gap between those who order the projection of force and those who accomplish it?[112]

A second question involves the status of the myriad individuals who project force on behalf of the state but have not agreed to their classification as warriors.[113] Traditionally, of course, humanitarian law has a decided repugnance for the targeting of civilians who are *hors de combat,* for whatever reason.[114] The point is that as stand-off weaponry becomes more sophisticated through the use of information technology, biotechnology, and space technology,

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[112] This has, arguably, already occurred to a large extent. As Secretary of State Madeline Albright asked Colin Powell in the 1990s, 'What's the point of having this superb military you're always talking about if we can't use it?" Sheldon Richman, 'Clinton's Quagmire,' *Freedom Daily*, July 1999, *retrieved at* http://www.fff.org/freedom/0799c.asp, 11/26/2009.

[113] This discussion, of course, requires better definitions of 'civilian' than are found in humanitarian law, which presupposes that those individuals are not geographically located on a battlefield, or, if on a battlefield, are not holding themselves out as combatants through the use of uniforms, hierarchies of command and other indicia of membership in military organizations. There are presently more than 700,000 Department of Defense employees and well over 100,000 civilian contractors in Iraq and Afghanistan, none of whom have presumably agreed to take up arms against all enemies *foreign and domestic* and most of whom would be surprised to find out that their employment status qualifies them for special handling when it comes to targeting. Department of Defense, 'It Takes More Than Soldiers to Protect America' *retrieved at* http://www.go-defense.com/, 11/20/2009; Renae Merle, 'Census Counts 100,000 Contractors in Iraq,' The Washington Post, December 5, 2006 *retrieved at* *http://www.washingtonpost.com/wpdyn/content/article/2006/12/04/AR2006120401311.ht... 11/25/2009*.

[114] Humanitarian law is that international law comprised of a set of rules which seek to limit the effect of armed conflict. Primary conventions include the Geneva Conventions of 1949, supplemented by the Additional Protocols of 1977 relating to the protection of victims of armed conflicts; the 1954 Convention for the Protection of Cultural Property in the event of armed Conflict and additional protocols; the 1972 Biological Weapons Convention; the 1980 Conventional Weapons Conventions and its five protocols; the 1997 Ottawa Convention on anti-personnel mines; and the 2000 Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict. International Committee of the Red Cross, 'What is International Humanitarian Law?' Advisory Service, 2004 *retrieved at* http://www.icrc.org/Web/Eng/siteeng0.nsf/htmlall/section_ihl, 11/25/2009.

etc. it becomes possible to project violence or aid in the projection of violence from civilian centers far removed from the traditional geography of the battlefield. Already, uniformed *pilots* in the United States position predator aircraft which kill and maim targets of opportunity in Afghanistan and Pakistan, causing collateral damage, e.g. death to unarmed civilians.[115] Is the civilian technician who maintains the equipment for the pilot in Nevada a legitimate target; is the civilian secretary who makes up the manifest and otherwise enhances the ability of the pilot to accomplish his mission a legitimate target? What responsibility does the state have for the protection of these individuals over and above what it owes the average citizen as a result of their status? Are they entitled, for example, to jump to the head of the line when vaccines are handed out? Do they have access to specialized bunkers in the event of nuclear warfare? Should their conduct be subject to specialized laws such as the Uniform Code of Military Justice? Is desertion from their place of employment during an emergency, for example, of such import that it should be punishable by death as is the case for their *co-workers* in uniform?

Defining those who do violence on behalf of the state has multiple ramifications, some which can be seen and some which cannot. It has been said that war is too serious a matter to be left to soldiers. If iron men and machines are the answer, it is a crossroads we face presently, it would seem, in the dark.

Consensual Risk? Soldiers, Uncertain Technology and Informed Consent

Conducting experiments on military personnel has a long and often sad history. Traditions of obedience, group requirements vs. individual rights, and the emergent nature of new and dangerous threats coalesce to create an environment in which experimentation or *testing* had been justified as immediately necessary in order to accomplish the mission. Medical experimentation, for example, often requires large study groups with homogenous populations of healthy individuals who can be studied over relatively long periods of time. Indeed, there are very few other organizations where these conditions exist.[116] Further, military personnel have

[115] Singer, *Wired for War, ibid*. pp. 326-28. Strikes in Pakistan began in 2004 and have increased in number and lethality ever since; 2004 (1), 2005 (1), 2006 (3), 2007 (5), 2008 (36) and 2009 through September (42). Civilian casualties, to the extent they can be determined with any accuracy appear relatively low as well: 20 civilian to 122 Taliban/Al Quida (enemy) in 2006; 0 civilian to 73 enemy in 2007; 31 civilian to 286 enemy in 2008 and 43 civilian to 404 enemy in 2009. Bill Roggio, Alexander Mayer, "Analysis: A look at US airstrikes in Pakistan through September 2009,' *The Long War Journal*, Oct 1, 2009 *retrieved at* http://www.longwarjournal.org/archives/2009/10/analysis_us_airstrik.php 11/25/2009.

[116] John McManus, Sumeru G. Mehta, Arnette R. McClinton, Robert A. DeLorenzo, Toney W. Baskin, 'Informed Consent and Ethical Issues in Military Medical Research.' *U.S. Army Academy of Emergency Medicine, v. 12, no. 11, November, 2005*.Two examples of state run, yet non-military, medical experiments are the U.S. medical research in Bilibid prison located in the American-occupied Philippines on prisoners to determine the efficacy of a cholera vaccine and the 1932 Public Health Service Tuskegee Syphilis Study. Here more than 400 African American men, suffering from syphilis were actively misled regarding their participation in the study and

been subjected to multiple technologies without studied scientific determinations regarding their short term or long term effects. Between 1954 and 1973, some 2300 Seventh Day Adventists served as conscientious objector *volunteers* in 137 protocols in defensive biological weapons testing. These experiments were directed at developing and '…testing vaccines and therapeutic drugs against Q fever, tularemia, various viral encephalitides, Rift Valley fever, sand fly fever, and plague.'[117]The Cold War produced numerous experiments on soldiers ranging from open air tests of radiological and bacterial materials[118] to LSD testing in order to determine the efficacy of the drug as a truth serum (also used in interrogations).[119]In Vietnam, military personnel were subjected to Agent Orange as part of a fairly substantial deforestation program which resulted in multiple cancers and birth defects.[120] And there is a good deal of evidence that military personnel and their families have been living with unknown degraded environmental hazards as well.[121]

Ironically, the military has developed a fairly robust set of rules and regulations regarding medical testing and experimentation over the years which can be said to rival and in some cases best its civilian counterparts.[122]Mindful of Nazi testing and committed to the rules which came out of the Doctors Trials at Nuremberg in the late 1940s,[123] military experimentation

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denied the benefits of penicillin. Multiple deaths occurred in these experiments and the manner in which they were conducted has led to a tradition of distrust of the medical community and the government which sponsored them. p.1121.

[117] McManus, *id.*

[118] American Patriot Friends Network, 'Secret US Human Biological Experimentation,' May, 2004 r*etrieved at* http://www.apfn.org/apfn/experiment.htm, 11/25/2009; *see also* Howard L. *Rosenberg, Atomic Soldiers: American Victims of Nuclear Experiments*. Beacon Press: Boston, 1980.

[119] U.S. v Stanley, 483 U.S. 669 (1987) r*etrieved at* http://caselaw.lp.findlaw.com/scripts/getcase.pl?court=US&vol=483&invol=669, 11/27/2009.

[120] United States Department of Veteran's Affairs, 'Agent Orange: Diseases Associated with Agent Orange Exposure,' *Office of Public Health and Environmental Hazards*, 2009, *retrieved at* http://www.publichealth.va.gov/exposures/agentorgange/diseases.asp, 11/27/2009.

[121] U.S. Medicine, "Legislators Express Concern Regarding Environmental Hazards,' November, 17, 2009 *retrieved at* http://www.usmedicine.com/articles/Legislators-Express-Concern-Regarding-Environmen.asp , 11/27/2009.

[122] McManus, 'Informed Consent and Ethical Issues in Military Medical Research,' *ibid*. p. 1124.

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Directives for Human Experimentation
Nuremberg Code

1. The voluntary consent of the human subject is absolutely essential. This means that the person involved should have legal capacity to give consent: should be so situated as to be able to exercise free power of choice, without the intervention of any element of force, fraud, disease, duress, over-reaching, or other ulterior form of constraint or coercion, and should have sufficient knowledge and comprehension of the elements of the subject matter involved as to enable him to make an understanding and enlightened decision. This latter element requires that before the acceptance of an affirmative decision by the experimental subject there should be made known to him the nature, duration and purpose of the experiment, the method and means by which it is to be conducted; all inconveniences and hazards reasonably to be expected; and the effects upon his health or person which may possibly come from his participation in the experiment.
   The duty and responsibility for ascertaining the quality of the consent rests upon each individual who initiates, directs or engages in the experiment. It is a personal duty and responsibility which may not be delegated to another with impunity.
2. The experiment should be such as to yield fruitful results for the good of society, unprocurable by other methods or means of study, and not random and unnecessary in nature.
3. The experiment should be so designed and based on the results of animal experimentation and knowledge of the natural history of the disease or other problem under study that the anticipated results will justify the performance of the experiment.
4. The experiment should be so conducted as to avoid all unnecessary physical and mental suffering and injury.
5. No experiment should be conducted where there is a prior reason to believe that death or disabling injury will occur; except, perhaps, in those experiments where the experimental physicians also serve as subjects.
6. The degree of risk to be taken should never exceed that determined by the humanitarian importance of the problem to be solved by the experiment.
7. Proper preparations should be made and adequate facilities provided to protect the experimental subject against even remote possibilities of injury, disability, or death.
8. The experiment should be conducted only by scientifically qualified persons. The highest degree of skill and care should be

requires the standard Institutional Review Board (IRB) proceedings mandated for all biomedical testing in the United States, contains a separate level of review above that, and must always include a therapeutic component.[124]

This regulatory system of protections is bottomed on rigorous informed consent requirements which, it has been argued, make human trauma and emergency research almost impossible.[125]Further, it is questionable whether in a culture which instructs-indeed demands obedience, if not reverence for authority-young men on and off the battlefield are capable of exercising independent judgment regarding sophisticated issues which are the subject of scientific experimentation. Soldiers constitute, perhaps, the ultimate vulnerable population, given this adherence to orders, potential for coercion by superiors, and the environment in which they make their decisions (battlefield, communal). Is it possible for a solider to be protected from the formal or informal coercion of a superior and at the same time commit to that superior's right and obligation to order him into battle?[126]

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required through all stages of the experiment of those who conduct or engage in the experiment.

9. During the course of the experiment the human subject should be at liberty to bring the experiment to an end if he has reached the physical or mental state where continuation of the experiment seems to him to be impossible.
10. During the course of the experiment the scientist in charge must be prepared to terminate the experiment at any stage. If he has probable cause to believe, in the exercise of the good faith, superior skill and careful judgment required of him that a continuation of the experiment is likely to result in injury, disability, or death to the experimental subject.

George J. Annas, Michael.A. Grodin, *The Nazi Doctors and the Nuremberg Code: Human Rights in Human Experimentation*. Oxford Univ. Press: New York, 1992, *reprinted from Trials of War Criminals Before the Nuremberg Military Tribunals Under Control Council Law No. 10.* U.S. Government Printing Office: Washington D.C., 1949. pp. 181-182.

[124] McManus, 'Informed Consent,' *ibid*. pp. 1122-23.; *see generally*, Barry Bozeman, 'Understanding Bureaucracy in Health Science Ethics.' *Ibid.* pp.1154-55 for a discussion of Institutional Review Boards.

[125] McManus, 'Informed Consent.' *Ibid.* p. 1122.

[126] Jessica Wolfendale, Steve Clarke, 'Paternalism, Consent, and the Use of Experimental Drugs in the Military.' *Journal of Medicine & Philosophy*, v. 33, issue 4, August, 2008, pp337-335.

Military commanders, as a matter of ethical obligation, assume responsibility for the safety of their men-and increasingly their dependents. They weigh this responsibility against accomplishment of the mission set before them and they are prepared to risk that safety in order to accomplish that mission or to insure the welfare of the whole over the individual. Soldiers understand this. It is part of the contract. Thus, soldiers are routinely put in harms way, tolerate unhealthy and dangerous environments, work with unsafe technologies and otherwise risk life and limb in the belief that commanders have reasons for the decisions they make. Commanders themselves, however, rely on their superiors to provide them with technologies that have a fair degree of efficacy before they are fielded. It is not in the commanders' lexicon to tell a soldier that he is not responsible for the failure of a technology or that he really has no opinion regarding the subject of a soldier's consent to an experiment. There is a phrase in the culture of leadership which is instructive, *the superior is responsible for everything his soldiers do or fail to do.* It can be argued that there is simply no place in the relationship for independent decisions by soldiers, especially about important matters. When technology is fielded and doesn't work, when it causes severe and unintended consequences, when it, not the enemy, threatens the soldier there is a delegitimization of authority. These conditions strike at the heart of military organizations and make them inefficient and incapable of performing the difficult tasks set before them.[127]

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[127]Scranton, 'The Challenge of Technological Uncertainty.' *Ibid*. p. The intersection between experimentation, perceived failure of technology and commander's authority is illustrated in the anthrax scare of the 1990s. Commanders have the legal right and responsibility to require service members to undergo various medical procedures, including treatments for injuries, psychological counseling, vaccinations and medical examination. These medical procedures are ordered both for the good of the service generally-to insure efficiency on the battlefield-and in compliance with the superior's ethical obligation to provide for the safety of the soldier. What happens when soldiers, empowered to rely on personal choice (the right to informed consent regarding experimentation and to denial of illegal orders), perceive that a specific procedure is potentially unsafe or not efficacious? Such was the case with the anthrax vaccination, ordered for all soldiers in 1998. Concerned over issues of sterility and other side effects, soldiers began refusing to comply with orders to take the vaccine, thus rendering them non-deployable in the eyes of their superiors, akin to refusal to wear helmets and flack gear. A history of the innovation of the vaccine was not helpful, given the fact it had been approved by the FDA primarily for anthrax sustained as a result of personal contact with infection rather than inhalation. Indeed, when the FDA approved the vaccine as safe, efficacious, and not misbranded it noted that the '…anthrax vaccine poses no serious special problems other than the fact that its efficacy against inhalation anthrax is not well documented.' It was, precisely, inhalation anthrax that was proposed as the justification for the use. Further, there had been problems with regard to its manufacture in the one facility licensed to provide the substance. And finally, the Institute of Medicine, while confirming that no long-term effects were known to exist also noted '…that research is currently insufficient to allow us to draw long-term conclusions.' A multitude of disciplinary actions were taken, forced resignations, and lawsuits in federal courts. Allegations that these vaccinations have caused injection site hypersensitivity, Guillain-Barre syndrome, multiple sclerosis, anaphylaxis and Gulf War syndrome have caused

There is a separate set of concerns arising from the intersection between the use of emerging military technologies and practices and civilian standards of care. Professionals in the military who *innovate* and *adapt* these technologies and practices are licensed by their respective disciplines, engineers, medical professionals, lawyers, psychologists etc. Indeed, their state licensure in good standing is a condition for their continued service in the military. What happens when a particular military practice is determined to be in violation of a particular state or national code of ethics? This issue has arisen in conjunction with military psychology and medical practice and its use during interrogation of suspected terrorists since 9/11. It has been fairly well documented that medical personnel, doctors, medics etc. and psychologists were routinely involved in various ways in the interrogation techniques after 9/11 which have formed the basis of the debate over interrogation/ *torture*. Sharing of information from therapeutic records with interrogators, advising interrogators regarding psychological weakness, useful techniques and practices, actually doing the interrogations, keeping records of interrogation experience (experimentation?) and otherwise being insinuated into the entire process of detaining and exploiting prisoners for the purpose of obtaining information-these and other practices which it has been argued by many constituted *torture,* were fairly commonplace.[128]They are now roundly condemned by fellow professionals at the state and national level.[129]

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soldiers to question the good faith intentions of their superiors. Goliath, 'Informed Consent in the Military: Fighting a Losing Battle Against the Anthrax Vaccine.' *American Journal of Law & Medicine,* 22 June, 2002 *retrieved at* http://goliath.ecnext.com/coms2/gi_0199-1833062/Informed-consent-in-the-military.html, 11/25/2009; MaManus, 'Informed Consent,' *ibid*, p.1124; Susan E. Lederer, 'Chpt 17,The Cold War and Beyond: Covert and Deceptive American Medical Experimentation,' in *Military Medical Ethics, v. 2.* Boden Institute, Office of the Surgeon general: Washington D.C., 2003.

> Lawsuits brought by veterans of biological, chemical, and atomic warfare studies continue to wend their way through the courts. The lawsuits permit a financial accounting of loss of life, liberty, and mental distress. They do not take into account the corrosion of trust in American researchers and the American government. Even more disturbing is the fear that these things could happen again unless adequate safe-guards remain in effect and the lessons of the past are learned. p. 529.

[128] *See generally* Senate Armed Services Committee Inquiry Into the Treatment of Detainees in U.S. Custody; Committee of the Red Cross Report, *retrieved at* http://www.nybooks.com/ircr-report.pdf 11/25/2009; Physicians for Human Rights, White Paper, 'Broken Laws, Broken Lives,' November, 28, 2007 ; Sheri Fink, 'U.S. Medical Personnel and Interrogations: What Do We Know? What Don't We Know?' ProPublica, April 9, 2009; Steven Miles, *Oath Betrayed: Torture, Medical Complicity and the War on Terror*. 2006 and 'Military Medicine and Human Rights,' *The Lancet,* v. 364, Issue 9448, 20 November 2004, pp.

A review of other professional codes of ethics will discover similar pronouncements regarding right professional conduct and adherence thereto.[130] These codes were generally created in

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1851-1852. All the above and many others have taken the position that psychologists complicit in the interrogation activities generally are in violation of the APA's ethical code: 'Psychologists strive to benefit those with whom they work and take care to do no harm,' *cited in* Stephen Soldz, 'Ending the Psychological Mind Games on Detainees,' *Op-Ed* Boston Globe, August, 14, 2008, *retrieved at* http://brokenlives.info/?tag=psychologists 11.30/2009; *but see* Michael L. Gross, *Bioethics and Armed Conflict, Moral Dilemmas of Medicine and War*. MIT Press: Cambridge, 2006, 'the contemporary dilemma of torture and ill-treatment sets lives of some against the self-esteem of others…If doctors remain convinced that interrogational torture could save more lives than other forms of interrogations, avoids unnecessary harm and only targets those who have forfeited their right to self-esteem, they may consider providing facilitating medical care during an interrogation.' p. 220.

[129] Coalition for an Ethical Psychology, 'APA Members Change Association's interrogations Policy' Blog of Stephen Soldz, September 17, 2008. 'Today the membership of the American Psychological Association (APA) passed a referendum banning participation of APA member psychologist in US detention facilities, such as Guantanamo or the CIA's 'black sites' operating outside of or in violation of international law or the Constitution'; Physicians For Human Rights, 'Broken Laws, Broken Promises,' i*bid*.; Johnathan Hutson, 'After Senate Report, Psychologists Who Tortured Must Be Held Accountable,' *Physicians for Human Rights*, April 21, 2009.

[130] A general review of various professional codes of ethics reveals a paucity of information which might be considered relevant to innovators of new technologies and practices. The American Psychological Association does speak to '…the welfare and protection of the individuals and groups with whom psychologists work and the education of members, students, and the public regarding ethical standards of discipline.' (Introduction to APA Ethics Code). They seek to '…minimize harm where it is foreseeable and unavoidable.' (Principle A). On the other hand when the standards are inconsistent with a requirement in law, regulations or other governing legal authority, the ethics code permits the psychologist to yield [to e.g. a government regulation or order]. (Standard 1:02 Conflicts Between Ethics and Law, Regulations, or Other Governing Legal Authority.APA Ethics Code, 2006), *retrieved at* http://www.apa.org/ethics/code2002.html 11/25/2009. The American Medical Association provides eleven principles which '…define the essentials of honorable behavior for the physician.' Interestingly, the principles do not contain the traditional *do no harm* proscription but do require the provision of competent medical care '…with compassion and respect for human dignity and rights.' (AMA Principles of Medical Ethics, Principle 1). In most cases, except emergencies, physicians retain the right to '…choose whom to serve, with whom to associate, and the environment in which to provide medical care.' (Principle 1). The American Psychiatric Association requires their members to follow the ethical prescripts of their medical colleagues. The American Society of Civil Engineers requires engineers to '…hold paramount the safety, health and welfare of the public' and to '…strive to comply with the principles of sustainable

contemplation of their respective civilian practices and do not contemplate the exigencies of the military environment and culture. Will it be necessary in the future to revamp licensing practices to create separate ethical codes for military professionals? Should civilian professional review boards continue to judge the professional activities of military professionals? Is there a difference between the ethical duties of military professionals and their civilian counterparts?

Uncertain technology, the need to know *now* what works on the battlefield, the empowerment of soldiers regarding individual decisions, the disconnect between civilian and military ethical standards and the emergent nature of the environment in which these decisions are made by innovators, commanders and users are all conflicting concerns, multi-laned intersections with few lights.

Of Old Laws and New Gadgets

When confronted with the considerable potentialities posed by emerging military technologies, their rapid innovation, adaption and use on the battlefield, one is tempted to throw up one's hands, declare all the old rules dead, and begin anew to draft proscriptions that comport to some new 21st century logic. It can be argued that this would be a mistake. It should be remembered that humanitarian law-those sets of rules and norms which seek to limit the effects of armed conflict-are the product of centuries of experience. The *genie* has been out of the bottle before and demonstrated to mankind in the first half of the 20th century the ramifications of minimal rules and inattention to governance. For all their failures, the Geneva Conventions of 1949, the Human Rights Regime, and the subsequent conventions which purport to address specific issues regarding the projection of force (the rules) have been created at special moments in history, when states were prepared, for whatever reason, to acknowledge the failure of unilateral power to order or at least constrain the horrors of the

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development in the performance of their professional duties.' American Society of Civil Engineers, Code of Ethics, *retrieved at* http://www.asce.org/inside/inside/codeofethics.cfm 11/24/2009. A private professional association, ISACA, which purports to serve' IT governance professionals' requires their members only to '…support the implementation of, and encourage compliance with, appropriate standards, procedures and controls for information systems.' ISACA Code of Professional Ethics *retrieved at* http://www.isaca.org/Template.cfm?Section=Code_of_Ethics1&Template=/TaggedPage/T...11/25/2009 . There is even a Code of Ethics for robots being proposed by the Republic of South Korea, although the terms of the Code have yet to be fleshed out. The main focus of the charter appears to be on dealing with social problems, such as human control over robots and humans becoming addicted to robot interaction (robots as sex toys etc.). The document will also deal with legal issues, such as the protection of data acquired by robots and establishing clear identification and traceability of the machines. Republic of Korea, Ministry of Information and Communication *as quoted in* Stefan Lovgren, 'Robot Code of Ethics to Prevent Android Abuse, Protect Humans,' *National Geographic News,* March 16, 2007, *retrieved at* http://news.nationalgeographic.com/news/2007/03/070316-robot-ethics.html, 11/26/2009.

battlefield. For the realist, it is only recognition that some sense of governance has its usefulness; for the idealist there is a hope that man can learn something from death and dying on a massive scale. No matter the disagreement, the rules have had their benefits.[131] The argument continues that it is only by ignoring them, failing to recognize their relevance to these new technologies, that they become obsolete.

Clearly the environment in which warfare is conducted has changed radically. There is still the possibility of armed conflicted between nation states doing battle in defined geographies with relatively symmetrical weapons systems. The first Gulf War is an example of this type of conflict; nation-states fighting with uniformed soldiers, constrained at least in part from using all the weapons available- no gas, no anthrax, no revenge or retribution. Thousands of Iraqi soldiers and a number of American soldiers benefited from rules regarding the treatment of prisoners of war in this conflict. Even the United Nations ultimately gave this war its blessing. There is no reason to believe that in the 21st century, this type of conflict will not occur again. In a number of other conflicts, Vietnam, Kosovo, and the 2d Iraq War, at least one side-the United States-has seen fit to conduct itself in relative compliance with the rules. Again, for the soldiers on the ground, especially enemy soldiers, or the pilots taken prisoner, these rules have often had their benefits.

Yet there has been an increasing drift towards warfare in which at least one party denies the relevance of the rules completely, fights asymmetrically using all manner of weapons and practices that are clearly prohibited. Civilians are the biggest targets, the ultimate losers in these conflicts. These conflicts are fought amongst them; they are targeted and terrorized. The ability to get at them becomes proof that adversaries are powerful, capable of delegitimizing the security efforts of governments. The conflicts are fought in a fish bowl; media coverage and the NGO industry are big business, and the soldier's conduct provides the justification for their work. Further, the American soldier in Iraq, Afghanistan, Colombia, Yemen, the Philippines, Somalia and elsewhere[132] can have no expectation that he will be treated in compliance with

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[131] As has been discussed previously, at footnote 57, there is some evidence that since these rules were put in place in the second half of the 20th century-and since weaponry has become increasingly more lethal-warfare has killed fewer people, a decrease of some 82% compared to the first half of the century. Alex Roland, 'Keep the Bomb.' *Ibid*. pp. 67-69.

[132] Robert D. Kaplan notes that:

> [T]he turn of the twenty-first century found the United States with bases and base rights in fifty-nine countries and overseas territories, with troops on deployments from Greenland to Nigeria to Singapore…Even before the terrorist attacks on the World Trade Center and the Pentagon on September 11, 2001, the U.S. Army's Special Operations Command was conducting operations in 170 countries per year.

Robert D. Kaplan*, Imperial Grunts, The American Military on the Ground*. Random House: New York, 2005, p.7.

the rules. Rather, he can expect to be beaten and beheaded on camera if captured; he can expect all manner of perfidy, use of civilians as shields, suicide attacks, retribution, mercenaries, spies, and disrespect for medical personnel. Conduct on the battlefield is less constrained than at any time since World War 11; the adversaries are no longer nation states and are committed to using whatever tools are available to outlast the American soldier until the American public tires of the conflict, and he goes home. Then, if 9/11 provides any example, the enemy will follow the soldier to his house or favorite shopping mall and kill him and his loved ones there. There is a nihilism about all this that denies the rationality of the rules and leads the innovator, adaptor, and user of technologies to ask, why follow the rules anyway?

Soldiers strap on not just new technologies when they confront these enemies but new responsibilities in the manner in which they operate. They are required to embrace the *warrior-builder-diplomat spirit*[133] which incorporates the humanitarian justification for their actions. Technology which is permitted to operate outside that spirit is at loggerheads with the new strategy, alienates precisely the people the soldier is sent to secure, and ultimately defeats the purpose of the projection of force. The definition of victory here is measured by adherence to humanitarian principles rather than in spite of them. This is the logic of counterinsurgency operations.[134]

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[133] David H. Petraeus, 'Letter to Soldiers in Iraq,' 15 March, 2007, *retrieved at* *http://www.weeklystandard.com/weblogs/TWSFP/2007/03/petraeus_letter_to_the_troops.asp, 11/30/2009*

> I also want you to be aware of my recognition that our focus on securing the population means that many of you will live in the neighborhoods you're securing. That is, in fact, the right way to secure the population-and it means that you will, in some cases, operate in more austere conditions than you did before we adjusted our mission and focus. Rest assured that we will do everything we can to support you as we implement the new plans. This approach is necessary, because we can't commute to the fight in counterinsurgency operations; rather, we have to live with the population we are securing. As you carry out the new approach, I also count on each of you to embrace the warrior-builder-diplomat spirit as we grapple with the demands that securing the population and helping it rebuild will require. p.2.

[134] FMI 3-07-22 Counterinsurgency Operations *retrieved at* http://www.fas.org/irp/doddir/army/fm13-07-22.pdf 10/30/2009.

> Section V1-Rules of Engagement
>
> 2-66. The proper application of force is a critical component to any successful counterinsurgency operation. In a counterinsurgency, the center of gravity is public support. In order to defeat an insurgent force, US forces must be able to separate

The rules take no position regarding the justice of any particular conflict, *jus ad bellum*, but rather speak to how we conduct ourselves while involved, *jus in bello*. They assume that wars will end and that the level of enmity that exists during the peace, indeed, the potential for the peace to last, will be based, in part, on the manner in which the parties conducted themselves during the war. Lingering hatred between the adversaries based on the manner in which they fought can corrode a peace and form the basis for new conflict. A second reason for the rules involves the psychological morale of the soldiers themselves. The ideological underpinnings of soldiers who fight these wars on the side of democratic states matter. John McCain has famously made this point:

> This is the destiny of democracy, as not all means are acceptable to it, and all practices employed by its enemies are open before it. Although a democracy must often fight with one hand tied behind its back, it nonetheless has the upper hand. Preserving the Rule of Law and recognition of an individual's liberty constitutes an important component in its understanding of security. At the end of the day, they strengthen its spirit and allow it to overcome difficulties…
>
> The enemy we fight has no respect for human life or human rights. They don't deserve our sympathy. But this isn't about who they are. This is about who we are. These are the values that distinguish us from our enemies, and we can never, never allow our enemies to take those values away.[135]

> insurgents from the population. At the same time, US forces must conduct themselves in a manner that enables them to maintain popular domestic support. Excessive or indiscriminant use of force is likely to alienate the locate populace, thereby increasing support for insurgent forces. Insufficient use of force results in increased risks to US and multinational forces and perceived weaknesses that can jeopardize the mission by emboldening insurgents and undermining domestic popular support. Achieving the appropriate balance requires a through understanding of the nature and causes of the insurgency, the end state, and the military's rule in a counterinsurgency operation. Nevertheless, US forces always retain the right to use necessary and proportional force for individual and unit self-defense in response to a hostile act or demonstrated hostile intent. p. 2-13.

[135] Pierre Atlas, 'Even If It Works, US Shouldn't Torture,' *Real Clear Politics*, April 23, 2009, p.2 *retrieved at* http://www.realclearpolitics.com/articles/2009/04/23/even_if_it_works_us_shouldnt_tortur..., 11/30/2009.

There are a number of principles which underlie the rules and are relevant to the issue of governance of emerging technologies. There is a tension between the ability of a soldier to make important decisions within the boundaries of these principles, even as he is constrained by his recognized frailties, and AW which admittedly can sense, process and effect a particular environment unconstrained. The Geneva Conventions themselves do not purport to regulate specific technologies as a general rule but rather regulate the *use* of technologies by actors on the battlefield.[136]There are five main principles in the rules that bear discussing: *military necessity*, *proportionality, discrimination*, *a general prohibition on the employment of weapons of a nature to cause superfluous injury or unnecessary suffering* and *command responsibility*

Some weapons, it is argued, are patently inhumane, no matter how they are used or what the intent of the user is. This principle has been recognized since at least 1907, although consensus over what weapons fall within this category tends to change over time.[137]The concept here is that some weapons are design-dependent; that is, their effects are reasonably foreseeable even as they leave the laboratory. In 1996, the ICRC at Montreux articulated a test to determine if a particular weapon would be the type which would forseeably cause superfluous injury or unnecessary suffering. The SIrUS criteria would ban weapons when their use would result in:

a. A specific disease, specific abnormal physiological state, a specific and permanent disability or specific disfigurement; or
b. Field mortality of more than 25% or a hospital mortality of more than 5%; or

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[136] There are multiple conventions which purport to deal with specific technologies and practices including the 1999 Hague declaration concerning expanding bullets; Convention on the Prohibition of the development, Production and stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (1972); Convention on the prohibition of military or any hostile use of environmental modification techniques (1976); Resolution on Small-Calbre Weapon Systems (1979); Protocol on Non-Detectable fragments (Protocol 1) (1980); Protocol on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devises (Protocol 11) (1980); Protocol on Prohibitions or Restrictions on the Use of Incendiary Weapons (Protocol 111) (1980); Convention on the prohibition of the development, production, stockpiling and use of chemical weapons and on their destruction (1993); Protocol on Blinding Laser weapons (Protocol 1V to the 1980 Convention (1995); Protocols on Prohibitions or Restrictions on the Use of Mines, Booby-Traps and Other Devises as amended on 3 May, 1996;Protocol 11 to the 1980 Convention as amended on 3 May 1996); Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction (1997); Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Injurious or to Have Indiscriminate Effects , Amendment article 1, 21 (2001); Protocol 1 Additional to the 1949 Geneva Conventions; Convention on Cluster Munitions (2008). ICRC, 'International Humanitarian Law-treaties and Documents, *retrieved at* http://www.icrc.org/ihl.nsf/TOPICS?OpenView 11/03/2009.

[137] Art. 23(e) of the Regulations respecting the Laws and Customs of War on Land, Annex to the Hague Convention (1V) respecting the Laws and Customs of War on Land, 18 October 1907.

c. Grade 3 wounds as measure by the Red Cross wound classification scale; or
d. Effects for which there is no well-recognized and proven treatment.[138]

The operative term here is *specific*; the criteria speak to technology specifically designed to accomplish more than render an adversary *hors de combat*. The test, here, is purely medical and does not take *military necessity* into consideration. As such, it has been rejected by the United States specifically and the international community generally.[139]

The second principle, *military necessity* requires a different analysis. This principle '…justifies measures of regulated force not forbidden by international law which are indispensable for securing the prompt submission of the enemy, with the least possible expenditures of economic and human resources.'[140] *Military necessity* recognizes the benefit to friend and foe alike of a speedy end to hostilities-protracted warfare, it assumes, creates more rather than less suffering for all sides. In order to determine the necessity for the use of a particular technology, then, one needs to know what the definition of victory is, how to measure the submission of the enemy in order to determine whether the technology will be necessary in this regard. As indicated above, the new battlefield makes this a difficult analysis, but one that , given the goals of counterinsurgency doctrine, if for no other reason, needs be undertaken none the less.[141]

The third principle, *proportionality* is of considerable concern to the innovator and user of new technologies. A use of a particular technology is not *proportional* if the loss of life and damage to property incidental to attacks is excessive in relation to the concrete and direct military advantage expected to be gained.[142] In order to make this determination, it can be argued, one

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[138] A Kock, 'Should War be hell? *Jane's Defense Weekly*, May 2000, p. 23.

[139] Donna Marie Verchio, 'Just Say No! The SIrUS Project: Well-intentioned, but unnecessary and Superfluous.' *The Air Force Law Review,* Spring, 2001, v. 51.

[140] Daoud Kuttab. 'Indiscriminant Attack*,' in Crimes of War, the Book,* What *the Public Should Know*. W.W. Norton & Co.: New York. 2007. 'Military objectives are limited to those objects which by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization, in the circumstances ruling at the time, offers a definite military advantage.' *retrieved at* http://www.crimesofwar.org/thebook/indescriminate-attack.html 11/24/2009.

[141] This analysis comes up routinely in the discussion over the efficacy of the Powell Doctrine, that set of criteria for the use of US military force generally, which requires , amongst other things, the dedication of the entire weight of US military force towards a stated goal and a clear exit strategy. It abhors the sloppiness of the modern battlefield and guards against shifting goals which it refers to as *mission creep.* Colin Powell, 'U.S. Forces: The Challenges Ahead,' *Foreign Affairs*, Winter, 1992.

[142]U.S. Army Field Manuel 27-10, Law of Land Warfare, para. 41, change 1.

must consider the military necessity of a particular use and evaluate the benefits of that use in furtherance of a specific objective against the collateral damage that may be caused. While soldiers are not strangers to this type of analysis, one must consider that the changes in the battlefield, definitions of victory etc. alluded to above, require very specific politico-military considerations, made on the spot. These considerations make each use different. AW determinations are made on the basis of percentages. Machines act based on the probability that a particular determination is likely to fall within acceptable rules of engagement. Thus, given a particular set of criteria regarding what a noncombatant looks like, a UAV calculates the probability that a particular target meets that criteria and acts accordingly. The Machine can never be wrong because it only acts on the criteria programmed into it. The old cliché, *garbage in, garbage out* continues to be applicable here. It may well be that these difficult judgments are properly constrained by a whole host of human emotions and experiences that are unavailable to the machine, even as the machine is clearly more efficient regarding its ability to sense, process and effect the environment in which it finds itself.

Discrimination, the fourth principle, strikes at the heart of judgment. Indiscriminant attacks (uses) are prohibited under the rules. Indiscriminant uses occur when they are not directed against a specific military objective; employ a method or means of combat the effects of which cannot be directed at a specified military target (indiscriminant bombing of cities for example); employ a method or means of combat the effects of which cannot be limited as required; or are of a nature to strike military and civilian targets without distinction.[143]

A final principle of the rules is *command responsibility,* that principle which exposes a multiple of superiors to various forms of liability for failure to act in the face of foreseeable illegal activities. This is a time-honored principle, bottomed on the contract between soldiers and their superiors which requires soldiers to act and superiors to determine when and how to act. It has a long history reflective of the need for control on the battlefield.[144]Given the uncertain

[143] Guetlein, 'Lethal Autonomous Weapons,' *ibid,* p.21.

[144] This principle is noted by Sun Tzu in 500 B.C. in *The Art of War* and was recognized during the Middle Ages. During the US Civil War, Article 71 of General Orders No. 100, 'Instructions for the government of armies of the United States in the Field (known as the 'Lieber Code') imposed criminal responsibility on commanders for ordering or encouraging soldiers to wound or kill already disabled enemies. Its codification occurred in the Hague Convention (1V) of 1907 Respecting the Laws and Customs of War on Land and is explicitly described in the Additional Protocol 1 (AP1) 1977 to the Geneva Conventions of 1949 and has made its way into multiple war crimes cases including *In re Yamashita*, 327 U.S. 1 (1946), *United States v. Captain Ernest L. Medina*, and *The Prosecutor v. Zejnil Delalic, Zdravko, Zdravko Music, Hasin Delic and Esad Landzo*, Case No. IT-96-21-T Judgment, Trial Chamber, 16 November, 1998, The International Court for the Former Yugoslavia (ICTY). The ICTY provides for three elements regarding the theory i). The existence of a superior-subordinate relationship; ii) the superior knew or had reason to know that the criminal act was about to be or had been committed; and iii). the superior failed to take the necessary and reasonable measures to prevent the criminal act or

environment in which soldiers are placed today, the requirement that they project force with weapons which may have questionable legality, on which they are only minimally trained, and whose unintended consequences must be considered inevitable if unknown, one must ask who in the long chain of command back to the innovator and adaptor of the technology-be he civilian or military-might bear criminal responsibility for improper use leading to indiscriminate results. The recognition of Scranton's *technological uncertainty* certainly applies here as does the concept of forseeability.[145]

Article 36 of 1977 Additional Protocol 1 to the Geneva Conventions of 1949 requires that each State Party

> …determine whether the employment of any new weapon, means or method of warfare that it studies, develops, acquires or adopts

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punish the perpetrators thereof. It is also reflected in Article 28 (b) of the Rome Statute. Rome Statute of the International Criminal Court, U.N. Doc. 2187 U.N.T.S. 90. *See generally,* Brandy Womack, 'The Development and Recent Applications of the Doctrine of Command Responsibility: With Particular Reference to the Mens Rea Requirement,' in Sienho, Yee, ed. *International Crime and Punishment, Selected Issues.* Univ. Press of American: Lanham, Md., 2003, p. 117.

[145] The concept of universal jurisdiction is a customary international law norm that permits states to regulate certain conduct to which they have no discernable nexus. Generally, it is recognized as a principle of international law that all states have the right to regulate certain conduct regardless of the location of the offense or the nationalities of the offender or the victims. Piracy, slave trade, war crimes and genocide are all generally accepted subjects of universal jurisdiction. Belgium, Germany and Spain have all entertained such prosecutions. Arising out of the war on terror and Iraq, former President George W. Bush, former secretaries of defense and state Rumsfeld and Kissinger and former military commanders Powell and Franks have all been the subject of such suits. United States Senate, Republican Policy Committee, 'The Perils of Universal Jurisdiction', December 18, 2006 *retrieved at*, pp.4-5. The issue of l*awfare* is also of concern.*Lawfare* is a strategy of using or misusing law as a substitute for traditional military means to achieve military objectives. Each operation conducted by the U.S. military results in new and expanding efforts by groups and countries to use *lawfare* to respond to military force.

> As military technology evolves, so do the scenarios facing military planners. New types of weaponry raise a host of legal and ethical questions. For example, new weaponry that can destroy power networks through electrical transmissions may seem to be preferable to traditional bombs. When electricity grids are destroyed, however, hospitals and civilians will lose power as well, possibly resulting in civilian casualties. American military authorities are still grappling with many of these issues.

Councuil on Foreign Relations, Transcript, *Lawfare, The Latest in Asymetrics*, March 18, 2003, *retrieved at* http://www.cfr/publications.html?id=5772,12/10/2009.

> would, in some or all circumstance, be prohibited by international law….The legal frame work of the review is the international law applicable to the State, including international humanitarian law (IHL). In particular this consists of the treaty and customary prohibitions and restrictions on specific weapons, as well as the general IHL rules applicable to all weapons, means and methods of warfare. General rules include the rules aimed at protecting civilians from the indiscriminate effects of weapons and combatants from unnecessary suffering. The assessment of a weapon in light of the relevant rules will require an examination of all relevant empirical information pertinent to the weapon, such as its technical description and actual performance, and its effects on health and the environment. This is the rationale for the involvement of experts of various disciplines in the review process.[146]

The United States is not a signatory to this Protocol and thus, technically not bound by its requirements. To the extent that it sets out reasonable requirements and methodologies for use by states fielding new and emerging technologies, however, this treaty could well set the standard in international law for what is appropriate conduct. Failure to consider its mechanisms, definitions and proscriptions, then, may well constitute a road not taken.

Finally, regarding the intersection of emerging technologies, law and ethics there is the issue of ethical advice. Routinely, lawyers are used to accomplish this task when discussions occur regarding the ethical efficacy of a particular practice or technology. Lawyers in the military have been referred to as *the conscious of the command*[147] and yet, they are neither trained nor philosophically situated to accomplish this task.

When Tommie Franks, during the first days of the War in Iraq, made targeting decisions based on his lawyer, 'My JAG [Judge advocate General] doesn't like this, so we're not going to fire'[148] he was abrogating his responsibility to decide when to project force. His lawyer could tell

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[146] Kathleen Lewand, 'A Guide to the Legal Review of New Weapons, Means and Methods of Warfare, Measure to Implement Article 36 of Additional Protocol 1 of 1977,' *International Committee of the Red Cross*, *rev'd* November 2006.

[147] William G. Exhart, 'Lawyering for Uncle Sam When He Draws His Sword,' *retrieved at* www.law.umkc.cau/faculty/projects/trials...exhart.html, 11/23/2009.

[148] John J. Klein, 'The Problematic Nexus: Where Unmanned Combat Air Vehicles and the Law of Armed Conflict Meet,' *Air & Space Power Journal-Chronicles on Line Journal,* 22 July, 2003 p. 2 *retrieved at* http://www.airpower.maxwell.af.mil/airchronicles/cc/klein.html 11/20/2009.

him what he could *legally* do but not what he *should* do. That is an ethical decision. It requires a separate set of skills, a whole host of experiences, and a very different way of looking at the world to make that decision correctly. Policy makers-those involved in determining *if* a technology should be developed, *when* it should be developed, *how* it should be developed, and *who* should use it-consider legal determinations but must go well beyond them. The law is a conservative animal, often reactive and well behind the contemporary problem.[149] It, perforce, must look backward to precedent and place the present conundrum within the confines of what has gone before. It is, ultimately, bottomed on rationality, what is reasonable under the circumstance; on occasion, however, reason can miss the point. In addition, it does not consider answers to a whole host of other questions which as we have seen come up in the environment of the new battlefield.[150]One is reminded of the Star Trek episode summarized by Gutlein as follows:

> Captain Kirk encounters a world where war is waged by computers and probabilities. The worlds of Eminar V11 and

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[149] Ronald B. Standler, an innovator, notes his frustration with the law for other reasons:

> Law takes hundreds of years to fully evolve. Modern technology evolves on a scale of a few years. Therefore, law is unlikely to be an effective way to guide society in a reasonable and fair use of technology…Most attorneys are extremely adverse to taking risks. The study and practice of law considers disputes between two parties. Often one party to the dispute has engaged in awful behavior: intentionally causing harm to another person, fraud, coercion, duress, threats, exploitation, alternation or destruction of evidence, 'forgetting' unfavorable facts,…A lawyer learns to structure advice so that, in the future, when the other party has behaved badly, the client will be in the best possible position to seek protection from a court, perhaps by enforcement of a written contract or estoppels. This cautious attitude of attorneys can pose problems to engineers and entrepreneurs who are excited about new ideas (such as marketing a new product), or clients who want to do something unconventional, where legal protections are uncertain. Furthermore, most people, including most attorneys, don't like to do creative thinking, because they are afraid of making a mistake or afraid of failing to find a good solution. It is a lot easier to say 'NO!' than to design a way to accomplish an unusual or unconventional goal.

Ronald B. Standler, 'Response of Law to New Technology,' 12 October, 1998, *retrieved at* http://www.rbs2.com/lt.htm, 11/25/2009.

[150] For a particular example of what can go wrong when the legal profession invades and dominates the world of policy makers see Jack Goldsmith, *The Terror Presidency, Law and Judgment Inside the Bush Administration*. W.W. Norton: New York, 2007.

> Vendikar have been at war for over 500 years. The two planets have learned to avoid the horrors of war by the use of computers. When the computers score a 'hit,' casualty estimations are made, and people are ordered to disintegration chambers to be atomized. Captain Kirk is appalled by the scientific [rational?] approach to warfare. *They have made this war too easy and until they experience the horrors of war, there will never be any incentive to make peace.*[151]

If war is too important to be left to soldiers, technology may well be too important to be left to scientists and lawyers.

These are not questions which can be answered here, but they are seminal to the existence of traditional military institutions and the use of emerging technologies by them. It appears that these changes will occur incrementally with or without answers; indeed, they are already occurring. They are easy to ignore, especially when measured against the emergent concerns of winning battles, taking care of warriors, and the competition which appears inevitable in the 21st century. And yet…are these benefits so great that these technological innovations will be permitted to occur without at least some governance of their consequences?

THE ISSUE OF GOVERNANCE: SOME CONCLUSIONS AND SUGGESTIONS

Governance is difficult. It can have the best of intentions and, yet, fail miserably. Successful systems which seek to obtain compliance with a particular policy, rule, or directive have a number of characters which are relevant to the instant discussion. They are clearly defined, that is they are capable of identifying the problem to be solved, change to be made or goal to be obtained in simple, if general, terms. Their solutions are realistic, that is their articulations are not lists of what *ought* to be, but rather what *can*, in fact, be accomplished, given a particular set of circumstances and conditions. They are holistic in the sense that all stakeholders are identified and involved somehow in making the rules. And finally, the results of their rules are capable of measurement and, where appropriate, amendment. Good governance recognizes that if these characteristics are not addressed, pronouncements oft go unheeded. Indeed in some cases, the users rise up and change the system. [152]

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[151] Guetlein, 'Lethal Autonomous Weapons,' *ibid.* pp.14-15.

[152] There has been a good deal of discussion in recent years about the subject of good governance, especially in the development area. The United Nations, for example, lists eight characteristics which are: consensus oriented, participatory, adherence to the rule of law, effective and efficient, accountable, transparent, responsive, equitable and inclusive. United Nations Economic and Social Commission for Asia and the Pacific, 'What is good Governance?' United Nations, 2009 *retrieved at* http://www.unescap.org/pdd/prs/ProjectActivitiies/Ongoing/gg/governance.asp, 11/20/2009.; *see also* Sam Agrere, *Good Governance, Promoting Good Governance: Principles, Practices and Perspectives.* Commonwealth Secretariat, Marlboro House: London, 2000. The author is more

As we have seen, innovation comes from many places, is created for many reasons, and has many users. It appears to flourish best in an environment of competition; much of it has been democratized, that is it occurs outside of mainstream infrastructures…and it happens fast. Further, the military is hardly its biggest consumer. Innovation is capable of extremely attractive and worthwhile advances, and at present innovation is one of the main characteristics of modern culture. It has multiple intended and unintended consequences, many of which can be *game changers* causing shifts so seismic that whole cultural systems can be challenged and transformed before we know what has happened. Even given its sizable benefits, then, there would appear to be some justification for slowing down the train.

The goal, then, would be to insure that all innovation is accomplished in a culture that respects the long-term effects of its work, considers as best as possible the ramifications of its actions and insures that future consumers are aware of those ramifications perhaps post-design but well before application without putting too heavy a hand on the creative and competitive energies that create it.

Changing culture can never be a top down project. States are important players but it appears clear, they have a limited albeit important role to play in the way things happen. States have the bully pulpit, but more importantly they have the authority and the resources to reach down into all regulation centers and affect what occurs there. To the extent that they are consumers, as is the military, they are also capable of affecting the market place, what they buy and what they will not. They make treaties, wrestle in international institutions, and enforce norms. There are, of course multiple ways for states to do this. One, perhaps, would be to reorganize U.S. bureaucracies so that all pushers and pullers of innovation speak with the same voice, whether inside or outside government. Programs to evaluate and draft *modern* professional codes of ethics for consideration by those professions would be instrumental in the training of new innovators as they move through the ranks (bottom up). Education of consumers from an early age regarding the risks of innovation is already happening, but these are often sponsored by the Federal government or NGOs, spokesmen which often do not have the legitimacy to convince.[153]

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concerned with getting stakeholders content with the status quo, uncertain regarding change and afraid of regulation to participate in cultural shifts which have long-term rather than merely short-term benefits.

[153] Thomas Friedman speaks to changing the culture of energy use, in itself a culture which is bottomed on a certain set of technologies, through markets and other institutions in civil society. 'This country has never been more alive in terms of innovation'. Leadership, he argues, has not or is incapable of capitalizing on it. 'For markets to produce innovation, they need to be shaped, not by launching a Manhattan Project for energy but rather through markets….We are not going to regulate our way out this problem; we are only going to innovate our way of out of this problem.' Thomas L. Friedman, Comments at Conference, The Wilson Center of International Security Studies and Environmental Change, *Princeton, University*, October 21, 2008.

There is a reason why there are so many treaties signed by states which are honored in the breech. Of course rank hypocrisy is one of the reasons, but, in fact, many treaties are easily signed and ignored because they are so vague they lack the teeth required for commitment. Those with an interest in outcomes are hardly consulted, especially those users upon whom the proscriptions fall the heaviest. They are often written by elites with minimal knowledge, even after extensive consultation, of what rules can, in fact, gain traction.[154] Anti-drug campaigns rarely consult addicts or cocaine dealers, for example, piracy is considered the ultimate international crime yet nobody talks to the pirates.[155]

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[154] David Kennedy famously critiqued the Human Rights Regime. One of his criticisms bears repeating:

> [F]oregrounding form. The strongest attachment of the human rights movement to the legal formalization of rights and the establishment of legal machinery for their implementation makes the achievement of these forms an end in itself. Elites in a political system-international, national-which has adopted the rules and set up the institutions will often themselves have the impression and insist persuasively to others that they have addressed the problem of violations with an elaborate, internationally respected and 'state of the art' response. This is analogous to the way in which holding elections can come to substitute for popular engagement in the political process. These are the traditional problems of form: form can hamper peaceful adjustment and necessary change, can be over or underinclusive. Is the right to vote a floor-or can it become a ceiling? The human rights movement ties its own hands on progressive development.

David Kennedy, 'The International Rights Movement: Part of the Problem?' *Harvard Human Rights Journal* v. 15, Spring 2002.

[155] Obviously terrorists, addicts, drug lords and pirates have different concerns than those who would proscribe their conduct. Yet they exist within the same system. There are unofficial rules even for them, places they agree through custom or practice not to go and activities even they will not engage in. The author is reminded of a certain house of prostitution during the Vietnam War that serviced the VC at night and American soldiers by day. During their respective periods, it was probably the safest place to be in all the war for both sides.

Finally, the system of innovation is cultural in nature; its rules are defined by all the parts. There are proprietary concerns, reputational concerns, security concerns, commercial concerns, criminal concerns and humanitarian concerns. The military comprise only one piece, part pusher and part puller…innovator and consumer. It is therefore incapable, even it wanted to, of changing the system substantially by itself. On the other hand, while process is unbelievably important, especially in an age of complex multileveled industrial innovation, the decision about *innovation*, *adaption*, and *use* is made by one individual at a time. These individuals are motivated by all manner of concerns. There is often what they believe to be pure *reason* in their calculus, but there are also basic human considerations, fear, greed, idealism, treachery, etc. That calculus, military and civilian, must include an ethical dimension; one that requires the innovator to stop, even for a moment, to balance competing concerns in the interest of insuring that the result reflects not only who we *can* be but who we *want* to be.

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