Race to the Bottom: Information Superiority and the Human Soldier in the NBIC Era

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ABSTRACT

William S. Bainbridge (National Science Foundation) recently asserted that the convergence of nanotechnology, biotechnology, information technology and cognitive science (NBIC) could "vastly increase the scope and effectiveness of human performance . . . [and] will be based on material unity at the nanoscale and on technology integration from that scale." The emerging concept of NBIC also dovetails with the military's emphasis on network-centric warfare (NCW), and the concepts of distributed networking, self-synchronization, and peer-to-peer information sharing. What does NBIC/NCW mean for the individual soldier? How does the United States military propose to use advanced technologies to enhance soldier performance, and are these uses ethical? This paper begins to answer these questions by examining the way in which politics, technology, and discourse combine in the creation of the "cyborg soldier." It concludes that while much attention is given to the macro-level drivers of military transformation and the functional possibilities of NBIC and NCW, the ethics of enhancing soldier performance far beyond the constraints of normal human physiology has not yet received adequate public attention.

Keywords: network-centric warfare, warfighter, nanotechnology, adaptation, NBIC

It is not the strongest of the species who survive nor the most intelligent, but ones most responsive to change. Charles Darwin

INTRODUCTION

William S. Bainbridge (National Science Foundation) recently asserted that the convergence of nanotechnology, biotechnology, information technology and cognitive science (NBIC) could "vastly increase the scope and effectiveness of human performance . . . [and] will be based on material unity at the nanoscale and on technology integration from that scale."[1] What does NBIC/NCW mean for the individual soldier? How does the United States military propose to use advanced technologies to enhance soldier performance, and are these uses ethical? This paper begins to answer these questions by examining the way in which politics, technology, and discourse combine in the creation of the cyborg soldier. It uses discourse analysis to identify how stakeholders seek to stabilize this new approach to defense and national security, and to locate the human soldier within this new command and control space. The underlying conceptual framework envisions the military as a complex adaptive system in which human, organizational, and technological factors must co-evolve in response to the perturbation of asymmetric warfare. The paper demonstrates that while much attention is given to both the macro-level drivers of military transformation and the functional possibilities of NBIC, the ethical and social ramifications of ramping up soldier performance beyond the constraints of normal human physiology has not yet received adequate attention in the published discourse. (Please note that this paper represents an early public presentation of preliminary findings from a much larger project on defense transformation, network-centric warfare, and the American soldier in the era of NBIC. Subsequent research will include elite interviews with stakeholders and policy-makers in this policy domain).

METHOD/FRAMEWORK

Discourse analysis has not commonly been used in scholarly analyses of the defense industry or national security sector; this fact might be due both to the perceived "softness" of the approach by stakeholders in these fields, as well as the probable "left-wing" ideological tilt (many outside academia might prefer the word bias) of scholars working within the theoretical paradigm of "social constructivism." Yet in the security environment post September 11, rigorous qualitative/discourse analysis can elucidate many important tensions and possibilities facing the U.S. military, and by extension American society. Even a cursory familiarity with the controversies (as played out in the popular news media) attendant on the Revolution in Military

Affairs (RMA), the strategic and tactical implementation of the War in Iraq, and Secretary of Defense Donald Rumsfeld's insistence on restructuring the military for the era of asymmetric warfare and digital/bio/molecular technologies indicates that the national security sector is in flux. A social/cultural consensus regarding the War on Terrorism and the role of the American soldier in fighting this war does not yet exist to the same degree as, for example, the Cold War bipartisan consensus that followed the publication in the 1940s of George F. Kennan's famous article on containment,[2] and that essentially persisted [despite the major social detour that was the anti-Vietnam War movement] until the end of the Reagan era.

Yet "national security," particularly following a disruptive event such at the attacks on September 11, 2001, does not just "happen", nor can any consensus endure forever in light of ongoing evolution in the technologies, incentives, disincentives, and tactics of warfare. Rather, national security is foremost a cultural concept that is created, produced, and maintained by the interplay of technology, politics, and social discourse/negotiation. This analysis therefore presumes that language serves a necessary social function by supporting both coalition formation and agenda setting within the national security sector, and that increased attention by military planners to narratives developed by stakeholders, in the media, and by policy-makers can be an effective component of developing an effective strategy for winning the long-term war against terrorism. (Jason McCue suggests that serious attention to how language and myth shape reality within different cultures can also serve to undermine the enemy's appeal in certain contexts. As he puts it in a recent article from the British *Observer*, "We must attack the myth of al-Qaeda, the sense that they are all powerful, omnipresent and capable of toppling Western society. We must reveal terrorists for what they are: an opportunist ramshackle group of bloodthirsty extremists. We must tackle ignorance, poverty and injustice but we must do so on contemporary battlefields. These are no longer simply liberal ideals; they are essential weapons in the war on terrorism."[3]

The specific discourse method of frame analysis is used as a way "of depicting and engaging the array of arguments and counter arguments that surround complex social issues,"[4] in this case NBIC/NCW and the ethics of soldier performance enhancement via bio/molecular technologies. M. Hajer argues, "differentiating between distinct layers in a policy discourse allows for a more sophisticated treatment of the formative power of utterances in policy making."[5] This project adapts the Hajer method and focuses specifically on the storyline dimension of the defense transformation through advanced technologies. Storyline, in this context, does not connote "fiction" or "untruth." Rather, the storylines assembled and used by stakeholders in an unstable policy space (such as in the national security sector following the terrorist attacks of September 11, 2001) "help people to fit their bit of knowledge, experience or expertise in the larger jig-saw of a policy debate."[6] In addition, "policy discourse can be *constitutive* of identities", particularly where "fixed political identities and stable communities can not be assumed."[7] This aspect of discourse analysis is particularly important to this research project, given its focus on how the identity of the soldier—inclusive of training, expectations, and performance enhancement—must be re-conceptualised within the network-centric warfare paradigm. This does mean that every lesson learned in previous eras will be thrown out; indeed, part of the reason that the United States military is the dominant warfighting force in the world lies in its ability to merge classical warfighting doctrine and techniques with advanced technologies. However, the decrease in the number of actual forces (which means increasing reliance on small, mobile, special forces units of approximately 8-12 men), the capabilities created by NBIC technologies, and the emphasis on mobility and agility in dominating an asymmetric enemy/strategy, means that both professional and social expectations of what the individual human soldier can and should accomplish will expand. R. Armstrong and Col. J. Warner [2003] note "no historical precedent exists for the debate about the morality of improved/bioengineered body armor or the ethics of enhanced soldier performance. The bioengineered future of the battlefield . . . presents policymakers with an unprecedented challenge."[8] In this nascent debate, attention to discourse as constitutive of identity *and* expectations provides a method to track the interactions of stakeholders and society as the United States collectively creates and negotiates the new national security consensus, and builds a shared mental/cultural model of the soldier who can meet its demands.

RESULTS

Introduction

The preliminary results of this analysis concentrate on two major storylines developed via media reports and policy documents on the use of nanotechnology (and NBIC) in the 21st century military. The *functional* storyline links nanotechnology to performance enhancement in a technical way; that is, while the soldier is the perceived beneficiary of these advanced technologies, he remains largely in the background with the discursive focus trained on the technological side of full-spectrum dominance rather than the human. The *enhancement* storyline appears much less frequently in this initial sort of the data, though when it does it is usually by writers with stated military experience (such as Col. J. Warner, who is cited earlier in this article). Before discussing these storylines, however, this section begins by situating soldier performance enhancement via NBIC in the broader political and technological context of network-centric warfare and the global war on terror.

Soldier Performance Enhancment: Politics and Possibilities

According to Zach Dundas [2004], "few things seem less sleek than a football player. Yet on closer inspection, gridiron warriors emerge on the field as the world's most meticulously constructed athletes: they're specialised, split into castes, and built from layers of mesh cloth, plastic, steel, foam, and—finally—optimized flesh and bone."[9] Perhaps the only human more meticulously constructed than the gridiron warrior is the American soldier of the 21st century. For the U.S. military's vision of network-centric warfare (NCW) to be fully realized, the nodes on the new distributed front must take the form of a "cyborg soldier" whose flesh and bone has not only been optimised, but technologically enhanced far beyond even the capabilities of today's elite forces. For instance, the glossary of terms for the Department of Defense (DOD) planning scenario *Joint Vision 2020* defines NCW as "an information superiority-enabled concept of operations that generates increased combat power by networking sensors, decision makers and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization".[10]

In this war-fighting scenario, each soldier would become a human node within the distributed combat grid in much the same way as a computer networked via TCP/IP functions as a node on the global Internet. Ideally, just as in distributed networking and peer-to-peer computing, network-centric warfare will create a decentralized and robust fighting force in which real-time information continues to flow rapidly to each person/node even if one of the nodes fails (or, in this case, is otherwise incapacitated). The "network effect" also ensures that the combined information-processing and fighting capacity of a linked unit is exponentially greater than a non-linked one, similar to the way in which a traditional communications system such as the telephone network has a collective reach and power greater than the simple sum of its parts.[11] In effect, the networked unit becomes collectively intelligent, capable of operating in a synchronized way as decisions feed back through the organism [unit] iteratively and in real-time. As S. Callahan notes, "an overarching systems architecture integrates an array of capabilities such as command and control, surveillance, reconnaissance, intelligence, and targeting. Under this integrated system, advantages of individual platforms and capabilities are fused into a powerful joint war-fighting entity".[12]

Many of the enabling technologies for network-centric warfare exist today only as concepts or designs in research labs such as the Massachusetts Institute of Technology's Institute for Soldier Nanotechnologies (ISN). Nevertheless, expert advisory panels and institutes such as RAND and the National Academy of Sciences predict that within the next two decades there will be a convergence of disparate technological and scientific fields into the research framework of NBIC—integrated nanotechnology, biotechnology, information technology, and cognitive science. The emerging concept of NBIC dovetails with the military's emphasis on network-centric warfare (NCW), and the concepts of distributed networking, self-synchronization, and peer-to-peer information. Potential military application of NBIC also presages an order of magnitude increase in the physical and cognitive performance of the individual soldier and the networked combat unit—both of which will ideally be enabled and enhanced through human performance technologies to a capacity far beyond the physiological barriers now imposed naturally on even the best-trained forces. As a multi-authored release from the ISN asserts "the Army has established . . . ISN . . . to provide unprecedented soldier survivability capabilities to the individual soldier through breakthrough research on nanotechnologies. . . . ISN products are thus expected to benefit war fighters from 2005 to 2025 and beyond."[13]

Technology and Function

A more colloquial name for this storyline could be 'bells and whistles' in that the narratives link technology to military superiority in a straightforward way, and incorporate the human element only as a constituent component of the technical system[s]. For instance, journalist Karen Lurie begins her article "Instant Armor" with a brief discussion of the *Matrix* movie and its associated pop culture images of sleek actors slipping into flexible armor. She notes "the U.S. Army wants something even more amazing for our soldiers—uniforms that turn into lightweight armor on command" [a possibility that, according to one nanotechnologist cited in the article, "could be real in ten years"].[14]

Analyses focused on nanotechnology in a more immediate temporal sense emphasize the transformational aspects of this research field, and its necessary integration into most ongoing research programs. As S. Callahan notes "it must be stressed that MEMS [microelectromechanical systems; and by association, nanotechnology] are a multidisciplinary approach to design and fabrication, not simply a class of products."[15] In his testimony [1999] before the House Subcommittee on Basic Research, Ralph C. Merkle (nanotechnology expert) argues "economic progress and military readiness in the 21st century will depend fundamentally on maintaining a competitive position in nanotechnology", and that "the first group to develop assemblers will have a historic window for economic, military, and environmental impact".[16] [The issue of assemblers—and the broader goal of molecular nanotechnology—remains controversial within the policy/scientific community. The intricacies of that debate are not discussed here]. Similarly, *Jane's International Security News* [2003] states "nanotechnology has the potential to create entirely new weapons", and that many advocates "argue that nanotech has the potential to negate current forms of military power, and that an opponent could, in the future, use nanotechnology to greatly enhance their defensive or offensive military capabilities."[17]

The functional narrative, then, stresses nanotechnology as a foundation for the future of warfare. Integrated with policy vocabularies and metaphors such as "fourth-generation nuclear weapons", "instant armor", "bullet-resistant material" and "knowledge superiority", this storyline works to anchor nanotechnology as real in both a conceptual and technical sense—a function that is particularly important as it is often difficult for non-scientists to envision how one could literally build new materials and technologies atom by atom [or molecule by molecule]. Within the documents that build this narrative, mention is also usually made of the other countries engaging in nanotechnology research, such as Russia, China, Britain, and South Korea, which helps accelerate political momentum for a concerted national effort to fund and scale-up American nanotechnology investment. It is not coincidental that the Congressional debates on the *21st Century Nanotechnology Research and Development Act*, signed into law by President Bush on December 3, 2003, used the phrase "grand challenges" to refer to specific research goals within the nanotechnology field. The phrase "grand challenges," which is used infrequently in United States policy-making [particularly compared to Western European countries, and especially France] refers solely to extremely high-risk, high-payoff collective public-private efforts in critical areas such as space exploration. The dominant discourse surrounding debates on nanotechnology frames it in just these terms: mission critical, high-risk, but necessary to United States national security and continued dominance of the warfighting space.

Technology and Enhancement

R. Armstrong and J. Warner argue "knowing a soldier's genetic profile could be useful for many reasons. Having such information could assist in selecting individuals for certain missions".

They also note that "the Office of Naval Research [ONR] is conducting several medical investigations, including ways to control pain without degrading performance . . . and examining ways of placing injured warfighters in suspended animation, to slow their metabolic rate."[18] A report by the Pacific Research Institute [2002] emphasizes that "if military nanotechnology can deploy networks of distributed sensors utilizing high-level computational power to process and analyse their data, there is no reason why civilian nanotechnology could not integrate similar networks into the human body, providing drastically enhanced mental, physical, and sensory abilities."[19] One presumes that this integration of digital and human cognition would first be tested on human soldiers in combat.

While not as frequent as the functional narrative, the storyline linking NBIC to human performance enhancement constitutes a crucial component of military transformation to network-centric warfare. Yet, as S. Callahan notes "many RMA supporters neglect individual soldiers as beneficiaries of the evolution through information, communication, situational awareness, survivability, and lethality."[20] This preliminary analysis of key documents, stakeholder testimony and media reports also suggests that many supporters neglect the ethical and social aspects of human performance enhancement via advanced technologies. Armstrong and Warner call for a military equivalent of the Human Genome Project's ELSI initiative, in which 3-5% of the public funding allocated to the project must be spent on canvassing the ethical, legal, and social implications of genetic research. The results of this research suggest that the organizational and transformational implications of the NBIC-enhanced soldier also need to be addressed formally, perhaps via a mechanism such as the President's Council on Bioethics. When the individual soldier is expected to be a "digital node" within a distributed fighting force, and the emphasis is on peer-to-peer networking and self-synchronization, then command and control hierarchies, by definition, must flatten. The interaction between technological innovation and military culture could, in this regard, be profound—indeed, will have to be in order to realise the full benefits of ramping up the performance and intelligence [both literally and metaphorically] of each soldier. In reference to the Navy, for instance, R. O'Rourke (2002) concludes "the Navy recognizes that it needs to develop new tactics, doctrine, and organizations to take full advantage of NCW; this could significantly alter current practices, if not the leadership culture itself, and pose challenges for retraining Navy personnel."[21] In a magazine article titled "The Network is the Battlefield," the author concludes "the military will have to deal with the seismic cultural shift that would result from ubiquitous connectivity and data," and quotes Jim Lewis's (Director/Technology Policy, Center for Strategic & International Studies) concern that "'It's easier [with NCW] for the command to micromanage. There is this impression that instant communication lets us do remote-control war-fighting. And that's a danger.'"[22]

This transformation could also, in turn, change the basic qualifications of an ideal recruit—shifting the focus from recruiting broadly across society to concentrating on a smaller but more elite cohort with the academic, physical, and psychological profile most conducive to withstanding the stress of human performance enhancement. While perhaps the best approach to fighting asymmetric warfare, the downside implications of NBIC/NCW for the military's social role as an engine of educational opportunity and economic mobility for the marginalised and the working-class needs to be canvassed seriously by stakeholders and policy-makers.

Conclusion

In contrast to the original [inductive] assumption that guided the early stages of this research project, very little public literature or testimony yet addresses the ethics of human performance enhancement in the military realm. Issues such as genetic engineering, gene therapy, and gene-doping [particularly in professional sports] currently receive an enormous amount of attention, ranging from elite institutions such as the President's Council on Bioethics to mainstream popular magazines. However, the literal and discursive construction of the "cyborg soldier" or the "bio-engineered" soldier does not [or at least not yet] take place within a broadly public forum—a fact that is particularly interesting given mainstream American attention to, and cultural respect for, the armed forces, as well as the fact that the soldier-as-cyborg idea weaves through both science fiction novels and Hollywood movies. The morality of constructing a soldier that is "more than human", and the stress that this can be expected to place on even the most ardent recruit, lurks as sub-text in some of the documents canvassed herein, but rarely dominates the discourse. Yet the need for formal analysis of the soldier's new role with network-centric warfare merits increased public attention. As S. Herrera argues "the difficulty with the new doctrine is that, at the moment, the U.S. Army doesn't really have the technology to arm its soldiers to fight such a war without incurring politically unacceptable casualties . . . . The infantry soldier is, as it were, a hairless, cowering ape, alone in the most lethal environment that ingenuity has been able to conceive."[23]

DISCUSSION

The Office of Force Transformation's report on military transformation [2003] notes "the primary need for highly adaptive network self-organisation is when there is movement from one innovation pattern to another".[24] Terrorism is a type of distributed warfare, and itself a strategic innovation, in which the enemy is amorphous, and unhinged from any conclusive nation-state sponsorship. To combat the agents of global terrorism, who are organised into fluid, dispersed cells that, collectively, exhibit resilience and adaptability, the American military must rapidly transition from a predominantly hierarchical and centralised strategy to a doctrine that proves as equally robust and adaptable as loosely linked terrorist groups moving toward essentially the same objective. In the words of John Reppert, retired brigadier general, "'more and more of the units we send into battle are small and quickly become fragmented, fighting battles in cities—street to street, doorway to doorway. This is the future.'"[25]

The key to dominating this new form of warfare lies in focusing less on mass [as in number of forces], and overwhelming nuclear dominance, and more on responsiveness in the form of agile cyborg-soldiers linked into a "learning ecosystem" that can rapidly swarm the target, accomplish the objective, and disperse. Indeed, the reality of global terrorism is that the "front" is distributed, and the space/time dimension largely irrelevant. Just as anti-virus software must continually adapt to new and mutable computer viruses unleashed by hackers located around the world, a fighting force faced with the new strategic challenge of large-scale terrorism must have the ability to shift, process data, and adapt instantaneously.

However, as E. Herdman [2002] asserts "the starting point [for policy] is the problematization rather than the problems".[26] Obviously, the military cannot and should not stand still in the midst of global terrorism—indeed, the ongoing revolution in military affairs is actually evolutionary in that change and adaptation are intrinsic to the strategic environment in which we all now live. From this perspective, a "President's Council on Performance Enhancement of the Human Soldier" might seem an irrelevant bureaucratic luxury. Nevertheless, as Kash and Rycroft [2002] argue, "trajectory evolution is the consequence of carrying out the innovation processes that emerge from the members of the network and the larger technological community as they repeatedly strive to push the state-of-the-art".[27] When pushing "the state-of-the-art" potentially involves redefining what it means to be "the best that you can be," and when it requires technological enhancements and bio-molecular innovations that mimic natural processes while simultaneously extending human performance far beyond what has previously been naturally possible, then a substantial part of the discourse and negotiation about this new strategic space should consider the moral and social consequences of the cyborg soldier.

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