

Hillbilly Armor and C-Legs: Technologies and Bodies at War¹

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Introduction

If you are looking for a silver lining to the wars in Iraq and Afghanistan, allow me to suggest this: they will eventually lead to important advances in prosthetics technology and rehabilitative care for amputees. This ironic relationship is not a new development, although the ways in which it is currently being driven and embodied are new.

A specialized craft of making artificial limbs first emerged in the United States following the Civil War to cope with the amputees created by the war. This period also saw important technological innovations such as rubber feet. World War II also produced many American amputees and led to the birth of the modern, medicalized American prosthetics field through large-scale infrastructure development, as well as scientific and technical research. This "swords into plowshares" effect is different now, though: work on prosthetics and amputee rehabilitation has quietly been stepped up in the midst of the war. The Defense Department has not released data on how many amputations have resulted from the wars in Iraq and Afghanistan, but current estimates are that 6% of soldiers

wounded in action have suffered amputations.² Nearly 15,000 soldiers had been wounded in action in Iraq as of the end of September 2005, so the numbers of amputations are still presumably very small: probably less than 1,000. For the sake of comparison, I would estimate, based on data from the Center for Disease Control, that over 200,000 Americans have had amputations resulting from complications of type II diabetes since the war in Iraq began.³

So, if sheer numbers are not driving the need for research and rehabilitation, as they did following previous wars, what is? I would suggest that it is the way in which this war is being fought. Iraq is the United States' first protracted engagement with urban guerilla warfare, and it is changing how bodies are wounded: American soldiers wounded in action in Iraq are at least twice as likely to survive their wounds than in previous wars, but are also twice as likely to become amputees and much more likely to suffer traumatic brain injuries. This paper briefly describes the interplay between Humvees, improvised explosive devices, and body armor in Iraq, and how it is wounding bodies in new ways.

Humvees

Politically speaking, the Iraq war began with two well-known blunders. One was the Pentagon's certainty that the initial combat phase of the invasion would be followed by an effort to win the hearts and minds of Iraqis. They failed to anticipate the insurgency. The second was that the Secretary of Defense was transforming the heavily armored military of the Cold War into a vision of a fast, light strike force. While this worked very well for the invasion of Iraq, it appears to have some drawbacks during the protracted urban guerilla warfare that has followed. American forces invaded Iraq in heavily armored tanks, but nothing says "occupation" like a tank, so soldiers were given Humvees in an effort to be more mobile and less obtrusive—and more able to engage with Iraqis.⁴

Humvees, or High-Mobility Multipurpose Wheeled Vehicles, were introduced in the mid-1980s and became the standard light

tactical truck for the Army and Marines.⁵ They are fast, rugged, and can be flexibly configured as troop carriers, weapons carriers, and even as ambulances.⁶ But they are essentially very tough jeeps without substantial armor and were never intended to serve as armored personnel carriers in combat.⁷ So when the insurgency began a few months after the invasion, one Marine officer pointed out the problem was that, "the war mutated from armored combat into a guerrilla campaign, and suddenly the tanks were parked and we moved out into the population without much protection."⁸

During the invasion, American soldiers encountered guns, mortars, and rocket-propelled grenades in combat, but insurgents started using improvised explosive devices, or IEDs, to attack vulnerable Humvees. IEDs are inexpensive to build, very effective against mounted soldiers (such as those in Humvees), and less risky than direct confrontation would be. As IED attacks on Humvees became more frequent, the Army quickly designed an add-on armor kit for them and increased production of a new, more heavily-armored model.⁹ In the meantime, soldiers in Iraq began to build their own homemade armor, using scrap metal and ballistic glass cut to size.^{10,11} This homemade version is commonly called "hillbilly" or "Mad Max" armor because of the junkyard aesthetic it introduces. Although up-armoring Humvees does add some protection, it also adds a thousand pounds to their weight and makes them slower, less mobile, and prone to break down more often due to the added stress.¹²

IEDs

Contrary to the Vice President's and Defense Secretary's assessments of the insurgents in Iraq as "dead enders" in their "last throes", they are sophisticated, organized, and adaptable. A recent article in the journal *Defense News*, based on interviews conducted at an Army conference on how to counter IEDs, describes small, non-hierarchical, independently operating IED cells that, in military parlance, are difficult to penetrate

or decapitate. They have well-defined roles, and they both exchange skills and advertise their services over the internet. They conduct their own intelligence work by planting hoax IEDs and then studying how American soldiers respond to the perceived threats, and even videotape their attacks for study afterwards.¹³

American forces have been playing a game with these IED cells in which each seeks to adapt past the other. When Humvees were up-armored, IED cells countered by developing larger and more powerful bombs. Most IEDs early in the war were made from relatively small mortars. They now use much larger artillery shells and, in some cases, even aircraft bombs.¹⁴ They also daisy-chain, or bundle, multiple artillery shells together, creating very powerful explosions capable of destroying armored Humvees and tanks.¹⁵

In the face of decreasing protection from armor, American forces organized a joint task force on IEDs to develop countermeasures.^{16,17} One was to use electronic jamming devices to prevent IED triggermen from employing garage door openers and other radio control devices to detonate bombs. As insurgents broadened their range of devices to detonate bombs, such as cell phones, the Army purchased new electronic jammers that blocked the phones and a wider range of signals.^{18,19} Early this summer, insurgents adapted again by starting to use infrared lasers as detonators or by returning to hardwiring the bombs.^{20,21} Insurgents have also apparently received bomb-making assistance from colleagues in Hezbollah and the Iranian intelligence services, and are now starting to make armor-piercing shaped charges.²² Another recent development is to mount IEDs off the ground, rather than underground, in order to increase their deadliness.²³

IEDs are not only widely used—there are forty IED incidents on an average day in Iraq—but are an increasingly popular tactic of the insurgents.²⁴ There were no American fatalities due to IEDs during the first four months of the Iraq war. But during the remainder of 2003, 14% of American fatalities were

caused by IEDs. The number increased to 22% in 2004, and then doubled to 45% in 2005. Last month, in September 2005, IEDs accounted for 75% of American fatalities and for many of the wounded. At this point, more American soldiers have been killed by IEDs than any other cause, including hostile fire.²⁵

Body Armor

In addition to misjudging the appropriateness of Humvees, the Army also failed to anticipate the need for body armor. Initially, the Army outfitted only dismounted combat soldiers with body armor.²⁶ When the insurgency began using IEDs against supply convoys, it became clear that the line between dismounted combatants and mounted noncombatant soldiers was fuzzy, so Army vendors increased their production and eventually equipped all soldiers with body armor by January 2004—but not before many soldiers had purchased their own armor.²⁷

The first body armor light enough to be used by American ground troops were flak jackets developed after World War II and used in the Korean War. A more heavily padded version of the same flak jacket was also used in the Vietnam War.²⁸ These flak jackets were made of ballistic nylon and, although fairly fragment resistant, were not actually bulletproof.²⁹ Body armor improved in the late 1970s and early 1980s, when police departments, and then the Army, started using a material called Kevlar, but the first two generations of Kevlar armor were too heavy.³⁰

The current system, called Interceptor body armor, is both lighter weight at sixteen pounds, and more effective.³¹ It is a vest made of Kevlar, with chest and back plate inserts made of a very hard ceramic material. The Interceptor body armor is truly bulletproof and its effectiveness borders on the bizarre at times. In one video made and originally posted to the web by Iraqi insurgents, an American medic is standing next to his Humvee. The crack of a sniper rifle is heard and the soldier drops to the ground, shot in the chest. He lays there for a couple seconds and then pops up, saved by his body armor, and takes

cover behind his Humvee.³² A recent article in Harper's relates a similar story:

"During a battle along the mountain ridges of Tora Bora, Afghanistan, in 2002, a Special Forces trooper was shot at close range by a Taliban fighter: three rounds from an AK-47 to the GI's chest. The soldier dropped to the ground, and a few moments later stood up again to shoot and kill his attacker. According to those who were there, it was like seeing Lazarus rise from the dead."³³

However, while body armor protects the soldier's chest and abdomen—their core mass—it does nothing to protect their heads, faces, or limbs. Army researchers are working on designs to add upper arm, shoulder, and leg modules to the Interceptor body armor and to develop liquid body armor which could be used in uniforms to protect limbs.^{34,35} But in the meantime, we are now fighting a war in which soldiers can survive being shot at close range with an AK-47, but are increasingly having their limbs blown off of their unscathed torsos by IEDs. The tragic interplay of IEDs, body armor, and battlefield medicine is radically changing how soldiers are killed and their bodies are wounded.

Wounded Bodies

Like body armor, battlefield medicine has much improved since the Vietnam War, in terms of speed as well as treatment.³⁶ Forward Surgical Teams, the modern version of MASH units, travel in Humvees and treat wounded soldiers very close to the battlefield. The wounded are then moved to Combat Support Hospitals and subsequently to hospitals in Kuwait, Spain, and Germany if needed. Seriously wounded troops are quickly flown back to the United States—on average, within four days of being wounded.³⁷ The survival rate compares favorably with previous wars: 90% of soldiers wounded in action survive their wounds, compared with only 76% in the Vietnam War or 70% in WW2.³⁸

However, the wounds are terrible. Army surgeons report relatively few chest and abdomen wounds due to the body

armor, but many head, face, and neck wounds, as well as "an unprecedented burden of what orthopedists term "mangled extremities".³⁹ Although soldiers wounded in action in Iraq are more likely to survive, the number of amputations is, by recent estimates, twice that of previous wars.⁴⁰ In addition, 20% of the amputees have lost more than one limb and 35% have lost an arm⁴¹ (compared to approximately 10% of civilian amputees).

Less visible, but very common, is the traumatic brain injuries, or TBI. Doctors at Walter Reed Army Medical Center have begun screening all soldiers wounded in explosions, vehicle accidents, falls, or by gunshot wounds to the face, neck, and head, and have found TBI in roughly 60% of the cases⁴² (compared to 12-14% in Vietnam).⁴³ Although the Kevlar helmets protect against penetrating wounds from fragments and bullets, they cannot protect soldiers' brains from the concussive injuries resulting from massive IED explosions.⁴⁴

Prostheses

The Defense Department has apparently noticed the effects of this war on bodies and is responding by building amputee care centers, funding prosthetics research, and supplying amputee veterans with state-of-the-art prostheses. In January 2005, the Army opened a second amputee care center at Brooke Army Medical Center in San Antonio (the first is at Walter Reed Army Medical Center in Washington) and will probably open a third center in San Diego in the future.^{45,46}

The army had also planned to build a Military Amputee Training Center at Walter Reed, but construction stopped after Walter Reed was slated for closure. The Center was to have a unique mission: to be at least partially devoted to retraining soldiers with amputations to return to combat. Just as well-designed rehabilitation centers in civilian hospitals often include mockups of kitchens, laundry rooms, supermarkets, and other scenes of daily life, the Military Amputee Training Center was to include obstacle courses, tank and terrain simulations, and weapons training for amputees.⁴⁷ This seems to signal that

the Defense Department is conceptualizing wounded bodies differently and sees them as much more recuperable than previously. Instead, another rehabilitation center will be built in San Antonio—without the military training capability—but soldiers are returning to active duty after disabling wounds nevertheless.⁴⁸

The Defense Department has also begun to fund prosthetics research. The projects are all rather futuristic and not likely to yield usable results in the near future, though they will probably be important in stimulating future development. The focus appears to be on upper-extremity prostheses, presumably because of the high proportion of soldiers losing arms and because the quality of artificial arms lags behind that of legs. The Defense Advanced Research Projects Agency, or DARPA, is working to develop "a complete prosthetic upper extremity with full motor and sensory function" that will "function as well as a normal human arm" and be operated by neural control.⁴⁹ This is ambitious, to say the least, and they have also proposed a shorter-term project to simply improve upon currently available arms.⁵⁰ Brown University and MIT are also partnering to create a bio-hybrid prosthesis using tissue generation, bone lengthening, osseointegration of titanium fixtures, and implanted sensors that assist neural control of prostheses—also rather ambitious.^{51,52}

In the meantime, until the troops can be bio-hybridized, the Defense Department is equipping amputees with high quality prostheses. The C-Leg for above-knee amputees, in particular, has received much attention in the press and in the *Doonesbury* cartoon series, where the character B.D. received one after losing one of his legs above the knee. The C-Leg is interesting because it is the first "context-aware" prosthesis in the sense that it is aware of how it is being used and adjusts accordingly. A difficulty in using above-knee prostheses is how to maintain stability during stance and swing phases of the gait cycle, or when one's heel hits the ground and when the leg swings forward for the next step. The C-Leg has sensors that

collect data on the user's gait and a micro-processor that helps control the stance and swing phases of gait, making walking a more natural and less conscious process.⁵³ Otto Bock, a German prosthetics company founded after World War I, introduced the C-Leg in 1999, but it has received much wider distribution (and an enormous amount of publicity) since the war in Iraq began.

What does all of this mean, especially here at home in the United States? The research initiatives are ambitious, but will probably lead to significant advances in prosthetics in the distant future, which may benefit the large numbers of Baby Boomers likely to lose limbs to diabetes. For now, the C-Leg promises to lead the prosthetics field into context-aware technology. And the tragic relationship between IEDs and defensive technologies such as Humvees and body armor provoke disturbing questions about how soldiers are dying and bodies are wounded in even more horrifically violent ways.

Economically, though, we will also feel the impact of this technological interplay in the high cost of rehabilitation for wounded soldiers. C-Legs are not cheap—they cost over \$30,000—and like any prosthetic limb, they must be replaced every few years over the lifetime of the amputee. The Department of Defense pays for the rehabilitation of soldiers while they are on active duty, but that burden shifts to employer-sponsored healthcare or the Department of Veterans Affairs when disabled soldiers are discharged. Veterans Affairs not only has a history of being chronically underfunded, but is currently plagued by budgetary ineptness: they seriously underestimated the numbers of veterans from the wars in Iraq and Afghanistan who require medical and rehabilitation treatment and the Senate had to pass an emergency appropriation of \$1.5 billion to cover a huge shortfall.^{54,55,56} Not only has current care suffered, but the VA has seen its budget for prosthetics research gradually reduced during the current war.^{57,58}

Much of the public attention to the wars in Afghanistan and Iraq has been focused on the dazzling or inadequate qualities of technology in combat, be it the “shock and awe” of precision

bombing or dangerously vulnerable Humvees. Let us also turn our attention to the long-term consequences and costs of these technologies—and perhaps more importantly, to their impacts upon the bodies of our fellow soldier citizens.

Notes

1. I would like to thank Prof. Nancy N. Chen for inviting me to present at the *Body Modifications* conference and for including my essay in this volume. Of course, I am solely responsible for the contents of this essay, and can be contacted at info@ethnographic-consulting.com. All arguments and conclusions presented in this essay are based on current events in October 2005.

2. There are actually two different rates of amputation being cited in the mainstream media and, curiously, both are described as being twice the rate of amputations suffered in previous wars. Many media accounts cite the 6% figure, for example:

“Data compiled by the US Senate, and included in the 2005 defense appropriations bill in support of a request for increased funding for the care of amputees at Walter Reed Army Medical Center, reveal that 6 percent of those wounded in Iraq have required amputations, compared with a rate of 3 percent for past wars.” (Mishra Raja, “Amputation rate for US troops twice that of past wars: Doctors cite need for prosthetics as more lives saved,” *The Boston Globe*, December 9 2004, available at www.boston.com/news/world/articles/2004/12/09/amputation_rate_for_us_troops_twice_that_of_past_wars/, accessed on September 30, 2005.)

As of mid-2004, Charles Scoville, Program Manager for the U.S. Army Amputee Patient Care Program, reported to the House Committee on Veterans Affairs that “during the current conflict, amputations account for 2.4% of all WIA.” (House Committee on Veterans Affairs, *Statement by Mr. Chuck Scoville, Hearing on the Evolution of VA-DoD Collaboration in Research and Amputee Care for Veterans of Current and Past Conflicts, as well as Needed Reforms in VA Blind Rehabilitation Services*, July 22 2004, available at veterans.house.gov/hearings/schedule108/jul04/7-22-04/cscoville.html, accessed on September 30, 2005.)

3. According to the Center for Disease Control, the annual number of “Hospital Discharges for Nontraumatic Lower Extremity Amputation with Diabetes as a Listed Diagnosis” has remained over 80,000 since 1997 (National Diabetes Surveillance System National Center for Chronic Disease Prevention and Health Promotion, “Hospitalizations for Nontraumatic Lower Extremity Amputation,” (2005), available at www.cdc.gov/diabetes/statistics/lea/fig1.htm, accessed on September 30, 2005.). Accordingly, I used a conservative estimate of 80,000

amputees per year since Operation Iraqi Freedom began in March 2003 to arrive at the figure of at least 200,000 amputees due to diabetes in that time period.

4. Jeffrey Sorenson Major General Stephen Speakes, Colonel John Rooney, "Special Defense Department Briefing on Uparmoring HMMWV," (U.S. Dept of Defense, Office of the Assistant Secretary of Defense (Public Affairs), 2004), available at www.dod.mil/transcripts/2004/tr20041215-1801.html, accessed on September 30, 2005.

5. Sandra I. Erwin, "Tactical Trucks for Tomorrow's Army: Can Commercial Vehicles Do the Job?," *National Defense* 2001, available at www.nationaldefensemagazine.org/issues/2001/Apr/Tactical_Trucks.htm, accessed on September 30, 2005.

6. Army Public Affairs, "HMMWV," in *Army Fact File*, available at www.army.mil/fact_files_site/hmmwv/, accessed on September 30, 2005.

7. John Barry, Babak Dehghanpisheh and Michael Hirsh, "'Hillbilly Armor': Defense sees it's fallen short in securing the troops. The grunts already knew," *Newsweek*, December 20 2004, available at www.msnbc.msn.com/id/6700920/site/newsweek/, accessed on September 30, 2005.

8. Michael Moran, "Frantically, the Army tries to armor Humvees: Soft-skinned workhorses turning into death traps," *MSNBC*, April 15, 2004, available at www.msnbc.msn.com/id/4731185/, accessed on September 30, 2005.

9. John Barry and Babak Dehghanpisheh Michael Hirsh, "'Hillbilly Armor': Defense sees it's fallen short in securing the troops. The grunts already knew," *Newsweek*, December 20, 2004, available at www.msnbc.msn.com/id/6700920/site/newsweek/, accessed on September 30, 2005.

10. "Troops Scavenge Scrap Metal to Protect Combat Vehicles," (ABC News, 2004), available at abcnews.go.com/WNT/story?id=312959&page=1, accessed on September 30, 2005.

11. John Barry and Babak Dehghanpisheh Michael Hirsh, "'Hillbilly Armor': Defense sees it's fallen short in securing the troops. The grunts already knew," *Newsweek*, December 20, 2004, available at www.msnbc.msn.com/id/6700920/site/newsweek/, accessed on September 30, 2005.

12. Jeffrey Sorenson Major General Stephen Speakes, Colonel John Rooney, "Special Defense Department Briefing on Uparmoring HMMWV," (U.S. Dept of Defense, Office of the Assistant Secretary of Defense (Public Affairs), 2004), available at www.dod.mil/transcripts/2004/tr20041215-1801.html, accessed on September 30, 2005.

John Barry and Babak Dehghanpisheh Michael Hirsh, "'Hillbilly Armor': Defense sees it's fallen short in securing the troops. The grunts already knew," *Newsweek*, December 20 2004, available at www.msnbc.msn.com/id/6700920/site/newsweek/, accessed on September 30, 2005.

13. Greg Grant, "Inside Iraqi Insurgent Cells, Captured Terrorist Intel May Help Defeat IED," *Defense News* (2005), available at staging.defensenews.com/story.php?F=999446&C=mideast, accessed on September 30, 2005.

14. Greg Grant, "Death Toll Sparks U.S. Debate On Origin of IED Expertise in Iraq," *Defense News*, August 15, 2005, available at staging.defensenews.com/story.php?F=949750&C=america, accessed on September 30, 2005.

15. Mark Washburn, "More Americans Dying from Roadside Bombs in Iraq," (Knight-Ridder, 2005), available at www.commondreams.org/headlines05/0610-05.htm, accessed on September 30, 2005.

16. Rey Guzman, "Joint IED Task Force helping defuse insurgency's threat," (ARNews Army News Service, 2005), available at www.globalsecurity.org/military/library/news/2005/07/mil-050718-arnews02.htm, accessed on September 30, 2005.

17. Sgt. 1st Class Doug Sample, "IED Conference Looks for Solutions to Save Lives," (American Forces Information Service, 2005), available at www.defenselink.mil/news/May2005/20050504_889.html, accessed on September 30, 2005.

18. Mark Washburn, "More Americans Dying from Roadside Bombs in Iraq," (Knight-Ridder, 2005), available at www.commondreams.org/headlines05/0610-05.htm, accessed on September 30, 2005.

19. Greg Grant, "Inside Iraqi Insurgent Cells, Captured Terrorist Intel May Help Defeat IED," *Defense News* (2005), available at staging.defensenews.com/story.php?F=999446&C=mideast, accessed on September 30, 2005.

20. David S. Cloud, "Iraqi Rebels Refine Bomb Skills, Pushing Toll of GI's Higher," *The New York Times*, June 22 2005, available at www.occupationwatch.org/headlines/archives/2005/06/iraqi_rebels_re.html, accessed on September 30, 2005.

21. Melissa Block, "Iraq's Insurgents Turn to Infrared Triggers," (NPR, 2005), available at www.npr.org/templates/story/story.php?storyId=4714571, accessed on September 30, 2005.

22. Greg Grant, "Inside Iraqi Insurgent Cells, Captured Terrorist Intel May Help Defeat IED," *Defense News* (2005), available at staging.defense.news.com/story.php?F=999446&C=mideast, accessed on September 30, 2005.

23. James Dunnigan, "The IED War in Iraq," (Strategy Page, 2005), available at www.strategypage.com/dls/articles/200541410.asp, accessed on September 30, 2005.

24. Greg Grant, "Inside Iraqi Insurgent Cells, Captured Terrorist Intel May Help Defeat IED," *Defense News* (2005), available at staging.defensenews.com/story.php?F=999446&C=mideast, accessed on September 30, 2005.

25. All statistics of American casualties in this paragraph were based on data from the online database "Iraqi Coalition Casualty Count," available at icasualties.org/oif/, accessed on October 13, 2005.

26. Vernon Loeb and Theola Labbé, "Body armor saves U.S. lives in Iraq: Pentagon criticized for shortage of protective vests," *The Washington Post*, December 4, 2003, available at www.msnbc.com/news/1000971.asp?cp1=1, accessed on September 30, 2005.

27. Michael Moss, "Many Missteps Tied to Delay Of Armor to Protect Soldiers," *The New York Times*, March 7 2005, available at www.globalsecurity.org/org/news/2005/050307-armor-missteps.htm, accessed on September 30, 2005.

28. Olive-Drab, "U.S. Military Body Armor: Vietnam Flak Vest," available at www.olive-drab.com/od_soldiers_gear_body_armor_vietnam.php, accessed on September 30, 2005.

29. Olive-Drab, "U.S. Military Body Armor (Flak Jackets)," available at www.olive-drab.com/od_soldiers_gear_body_armor_korea.php, accessed on September 30, 2005.

30. Mary Bellis, "History of Body Armor and Bullet Proof Vests," (About.com), available at inventors.about.com/od/bstartinventions/a/Body_Armor.htm, accessed on September 30, 2005.

31. Seth Stern, "Body armor could be a technological hero of war in Iraq," *The Christian Science Monitor*, April 2, 2003, available at www.csmonitor.com/2003/0402/p04s01-usmi.html, accessed on September 30, 2005.

32. "U.S. Soldier Survives Sniper Attack," (2005), available at www.ogrish.com/archives/us_soldier_survives_sniper_attack_Jul_16_2005.html, accessed on September 30, 2005.

33. Ronald J. Glasser, "A war of disabilities: Iraq's hidden costs are coming home," *Harper's Magazine*, August 12, 2005, available at uslaboragainstawar.org/article.php?id=8862&printsaf=1, accessed on September 30, 2005.

34. "Ballistic Protection to Counter the Effects of the Improvised Explosive Devices (IED) Threat," available at nsc.natick.army.mil/media/fact/individual/IED_Protection.htm, accessed on September 30, 2005.

35. Tonya Johnson, "Army scientists, engineers develop liquid body armor," *Army News Service*, April 21, 2004, available at www4.army.mil/ocpa/read.php?story_id_key=5872, accessed on September 30, 2005.

36. Dan Ferber, "Soldiers of Fortune?: Innovations in battlefield medicine are ensuring that more combatants survive. Often, the technology follows

them home," *Popular Science* 2005, available at www.popsoci.com/popsoci/science/49a20b4511b84010vgnvcm1000004eecbccdrd.html, accessed on September 30, 2005.

37. M. D. Atul Gawande, M.P.H., "Casualties of War — Military Care for the Wounded from Iraq and Afghanistan," *The New England Journal of Medicine* 351, no. 24, available at content.nejm.org/cgi/content/full/351/24/2471, accessed on September 30, 2005.

38. *Ibid.*

39. *Ibid.*

40. Mishra Raja, "Amputation rate for US troops twice that of past wars: Doctors cite need for prosthetics as more lives saved.," *The Boston Globe*, December 9, 2004, available at www.boston.com/news/world/articles/2004/12/09/amputation_rate_for_us_troops_twice_that_of_past_wars/, accessed on September 30, 2005.

41. "Executive Summary, Prosthetic Fitting & Adjustment Clinical Working Group, Traumatic Amputation QUERI Workshop," (Department of Veterans Affairs, 2004), available at www.vard.org/meet/queri/groups/fitting.pdf, accessed on September 30, 2005.

42. Gregg Zoroya, "Key Iraq wound: Brain trauma," *USA Today*, March 3, 2005, available at www.usatoday.com/news/nation/2005-03-03-brain-trauma-lede_x.htm, accessed on September 30, 2005.

43. Susan Okie M.D., "Traumatic Brain Injury in the War Zone," *The New England Journal of Medicine* 352, no. 20 (2005), available at content.nejm.org/cgi/content/full/352/20/2043, accessed on September 30, 2005.

44. Matthew B. Stannard, "The invisible wound: Though high-tech body armor saves lives on the battlefield, more and more troops are suffering traumatic head injuries," *San Francisco Chronicle*, July 14, 2004, available at www.sfgate.com/cgi-bin/article.cgi?file=/chronicle/archive/2004/07/14/MNGGE7L6971.DTL, accessed on September 30, 2005.

45. Staff Sgt. Reeba Critser, "Texas opens Army's second Amputee Center," (ARNews Army News Service, 2005), available at www4.army.mil/ocpa/read.php?story_id_key=6756, accessed on September 30, 2005.

46. "More injured troops are surviving," *Colorado Springs Gazette*, February 13, 2005, available at www.gazette.com/war/0213warxxa.html, accessed on September 30, 2005.

47. Bernard S. Little, "Walter Reed breaks ground for amputee training center," (ARNews Army News Service, 2004), available at www4.army.mil/ocpa/read.php?story_id_key=6582, accessed on September 30, 2005.

48. Sarah Baxter, "Bionic US troops go back to war," *The Sunday Times*, March 13 2005, available at www.timesonline.co.uk/article/0,,2089

-1522894,00.html, accessed on September 30, 2005.

49. DARPA/DSO, "Revolutionizing Prosthetics Presolicitation Notice," (2005), available at www.darpa.mil/baa/baa05-26.html, accessed on September 30, 2005.

50. DARPA/DSO, "Prosthesis 2007 Presolicitation Notice," (2005), available at www.darpa.mil/baa/baa05-19mod5.htm, accessed on September 30, 2005.

51. Brown University, The News Service, "VA Funds Leading-Edge Limb-Loss Research in Providence" (2004), available at www.brown.edu/Administration/News_Bureau/2004-05/04-061.html, accessed on September 30, 2005.

52. "VA Funds New Limb-Loss Research" (U.S. Department of Veterans Affairs, 2004), available at www1.va.gov/opa/pressrel/PressArtInternet.cfm?id=925, accessed on September 30, 2005.

53. "C-Leg: New Generation Leg System Revolutionizes Lower Limb Prostheses" (Otto Bock HealthCare), available at www.ottobockus.com/products/lower_limb_prosthetics/c-leg_article.asp, accessed on September 30, 2005.

54. Thomas B. Edsall, "Funds for Health Care of Veterans \$1 Billion Short: 2005 Deficit Angers Senate Republicans, Advocacy Groups," *The Washington Post*, June 24, 2005, available at www.washingtonpost.com/wp-dyn/content/article/2005/06/23/AR2005062301888.html, accessed on September 30, 2005.

55. Thomas B. Edsall, "VA Faces \$2.6 Billion Shortfall in Medical Care: Agency Undercounted Size of Returning Force," *The Washington Post*, June 29, 2005, available at www.washingtonpost.com/wp-dyn/content/article/2005/06/28/AR2005062800545.html, accessed on September 30, 2005.

56. Associated Press, "Senate Approves Additional Money for Veterans' Health Care," *The Washington Post*, June 30, 2005, available at www.washingtonpost.com/wp-dyn/content/article/2005/07/29/AR2005072901816.html, accessed on September 30, 2005.

57. "FY 2005 Budget Proposal Falls Short For Research" (The American Physiological Society Legislative Action Center), available at www.the-aps.org/pa/action/fy2005/FY05Budget.htm, accessed on September 30, 2005.

58. "Bush Budget? Bummer!" (The American Psychological Association), available at www.apa.org/ppo/issues/fy06budget.html, accessed on September 30, 2005.

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Nursing Memory: Who Deserves to Heal and After Which War(s)?¹

Megan Moodie

Stories of return from war are often narratives of citizenship. They retain a great deal of moral weight as cultural forms, a weight in part derived from the implied risk to the body in the name of dedication to country, and they compel collective listening in ways that the stories of those others of war—civilian victims, the "enemy"—simply do not. Because they seem to be told in a unified voice, differences, as they emerge, are striking. As such, veterans' stories tell us a great deal about how bodies are positioned in relation to the categories that make a difference within the nation-state: race, class, gender.

Until the first Gulf War, women who were in the military most often served as nurses. In World War II, 59,000 American women served as nurses in the Army and Navy Corps. At least 10,000 served in various capacities in Vietnam, most of them as nurses. These veterans have return tales that deserve a great deal more attention than they have received for the ways in which they not only tell us about women's experiences in and with the military, but also for what these narratives say about our definitions of citizenship, of gendered citizenship. Nurses' stories of return from war tell us about who deserves care—