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From Idiophylaxis to Inner Armor: Imagining the Self-Armoring Soldier in the United States Military from the 1960s to Today

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We do not know what the body can do.

———Spinoza

Unseen Armor to Guard Troops against Nature.

———Army *Stars and Stripes*, 3 Nov. 1962: 8

The component man is the one that fails the most often.

———Dr. Marion Sulzberger, West Point, 1962a: n.p.

All militaries try to develop a "winning edge" in warfare. More often than not, attempts to attain it focus on new weapons systems and weapons platforms, new ways of maximizing the offensive capabilities of a military through firepower. These efforts can also involve a focus on the training and development of soldiers, and on devising enhancements to make them fight better, longer, and smarter than the enemy. But soldiers are fragile, and if the history of warfare teaches us anything it is that military commanders, planners, and researchers, and soldiers themselves know this. Soldier-authors who glorified

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warfare in the early twentieth-century—for example, Jünger in Germany, Marinetti in Italy, and Gumiliev in Russia—discussed the fragility of the body-in-combat even as they spun out dreams and fantasies of internally armored bodies and the beauty of war and destruction (Gumiliev 1972 [1916]; Jünger 2003 [1920]; Marinetti 2009 [1915]; Poggi 2009; Segel 1998; Theweleit 1987; 1989). Indeed, from a military planning and implementation standpoint, the stress point of all military operations is the soldiers. Throughout the history of warfare, groups and nation-states have tried to develop superior warriors, to armor their soldiers against the enemy and their own fears and weakness. Soldiers are supposed to be made into, and then embody and project, an ideal of steely resolve and fortitude, unwavering bravery and compliance.

In *On War*, Clausewitz glosses these qualities as "boldness," and discusses how "the noble capacity to rise above the most menacing of dangers" is an important factor in the fortunes of war (1976: 190). "Boldness" is a way to think about combat and how militaries and states imagine soldiers who can be "made" bold in a predictable and reliable fashion. The opposites of boldness are timidity, weakness, and fragility. What is important to understand is how exactly militaries go about trying to solve the problem of fragile soldiers—fragile humans—who are never quite up to the dreams of 100 percent certainty and performance demanded by those in charge. Soldiers mentally and physically "break" in combat from wounds, trauma, and illness. In *On War*, Clausewitz writes: "All war presupposes human weakness and seeks to exploit it" (1976: 256; see also Singer 2008). This can be read as exploiting the weakness of your enemy, but what if the weakness that you want to identify and exploit in your enemy afflicts your own soldiers? Can novel technologies be developed to locate and overcome weaknesses in the body of your soldiers so as to extract more combat power and labor from them and make them more readily deployable? These concerns and problems have long held the interest of the U.S. military (see Ford and Glymour 2014; Singer 2008; Tracy and Flower 2014).

This article traces the development, rationale, and legacy of one such attempt to deal with human frailty and the "body problem" in the military, a kind of military futurism devised at the peak of the Cold War. This was the pursuit of Dr. Marion Sulzberger's vision of creating soldiers for the U.S. military who had their own kind of special, internally embedded biological armor, what he termed "idiophylaxis." In 1962, Sulzberger presented a paper at the Army Science Conference at West Point, under the auspices of the Office of the Chief of Research and Development of the United States Army (Army Invites 1962: 1), titled "Progress and Prospects in Idiophylaxis (Built-In Individual Self-Protection of the Combat Soldier)." Sulzberger's in his paper called for a radical rethinking of the combat soldier and the ways in which soldiers were imagined, designed, and developed. His "idiophylactic soldier" would be biomedically enhanced, internally and psychologically "armored" through new forms of biotechnology.

Sulzberger's idiophylaxis represents an important but little-known milestone in the U.S. military's biomedical research and interest in soldier performance enhancement, and it marks the emergence of a synthesis of technologies designed to protect and improve the soldier. Examination of his work can help us to historicize and trace how the U.S. military has imagined melding biomedical advances and military necessity, and the political, military, and technological conditions that drive the impetus to produce an internally enhanced soldier.

The importance and continued salience of Sulzberger's work can be seen in the Defense Advanced Research Projects Agency's (DARPA) 2007 "Inner Armor" program, which bears a remarkable resemblance to Sulzberger's conception of idiophylaxis, and seems to draw direct inspiration from and resurrect his dream of the self-armoring soldier. Much of what Sulzberger outlined in idiophylaxis in 1962—advanced immunizations and embedded protections against disease, "inbuilt" resistance to heat, cold, and altitude, and the transformation of the soldier's body into its own armor—was taken up and expanded upon in the "Inner Armor" program. Its goal was to creating "kill-proof" idiophylactic soldiers. The concern with soldier frailty and the synthesis of biotechnology and military necessity, similar to Sulzberger's vision, continued on in later projects such as the "Objective Force Warrior," the "Future Force Warrior," and the "Future Combat System," and in concepts like "skin-in solutions."

Sulzberger's reimagining of the soldier and his call for a redesign of soldiers from the inside out provide us with a lens through which to view subsequent U.S. military research projects and programs centered on soldier biomedical protection and enhancement. His work in the 1960s serves as an entry point from which to better understand the military's ongoing quest to design ever-better soldiers and think about the fantasy and intention of creating resilient, self-armoring, "kill-proof" warriors.

WAR, ANTICIPATION, AND IMAGINATION

Military performance-enhancement research is an endeavor of anticipation and imagination; soldiers must first be imagined before they are made (Bickford 2011). As idiophylaxis and DARPA's "Inner Armor" program highlight, the soldier is suspended between the "lessons learned" from the last war and the imagined horrors of the next. This suspension also means that imagination, fantasy, and a kind of playfulness, albeit of a serious sort, are necessary for imagining and making soldiers. Sulzberger's conception of idiophylaxis is somewhat ambiguous and fuzzy since it encompasses a crossover between performance enhancement and immunizations in ways that we do not generally think of now. But that fuzziness and ambiguity are also its strength, because it shows the range of things he imagined necessary to keep soldiers alive and functioning on the battlefield. Sulzberger's approach signals a complete rethinking of the soldier from the inside out, and helps us to rethink and

problematize military performance enhancements, immunizations, and how we think about "super soldiers."

There is a growing literature on war and embodiment, and the embodied experiences of military service, war, and violence (e.g., Bickford 2008; Dyvik and Greenwood 2016; Finley 2011; Hautzinger and Scandlyn 2014; Howell 2014; MacLeish 2015; McSorley 2014; Messinger 2010; Terry 2017; Wool 2015). My interest here, however, is in the biomedical and biotechnical imagination of warfare and what happens before embodiment and violence. How do military medical researchers plan and design "military embodiment" and design the body for war? How do military researchers imagine and develop the technologies and enhancements needed for military embodiment? What are the operational and technological "stressors" that shape the contexts for imagining enhancements and new kinds of soldiers? And how do you imagine and design protective technologies that will allow the soldier to survive war and emerge unscathed, or at least still useful? We can grapple with these questions and others through an examination of Sulzberger's work and DARPA's later "Inner Armor" program.

While many of Sulzberger's ideas were ambiguous, fantastic and fanciful, and possibly biomedically impossible, they continue to resonate and influence military medicine and performance-enhancement projects. His idiophylaxis and DARPA's "Inner Armor" program allow us to think about current U.S. military soldier-enhancement projects in a new light, and pose new questions and avenues of inquiry into how states imagine and "make" soldiers (Bickford 2010b; 2011) through biotechnology and the "ordering" of the soldier's biology.

THE STATE, THE MILITARY, AND BIOPOWER

Military planners and researchers might not know what a body can do, but they can imagine what they would like it to be able to do. At play in U.S. military biomedical research and development is a conception of biopower—the state's concern with and use of "life," "health," and "protection" as forms of discipline, intervention, and regulation—intended to manipulate and order the life and bodies of soldiers (Clarke et al. 2010: 4–6; Foucault 1980). My concern here is not so much an analysis or theorization of biopower and communities (see Esposito 2008; 2011); rather, I will use "biopower" as a way to analyze and detail the history, plans, and ideas behind a suite of biomedical interventions that focus on the direct intervention by the military and the state in the biology of the soldier, and to think about the implications and bioethics of military performance enhancement and military medicine.

Militarization and military medicine do not bring a body into being, but they do prepare the body for war and trauma, and in this sense they make the soldier ready to take part in the violent embodiment of war. For the military, the "body" is not necessarily an existential or philosophical problem to solve, but is a material problem rooted in the needs of war and combat. In many ways,

the military's "body problem" is a labor issue: how can the military extract as much labor, or "combat capability," from the soldier as possible without actually harming the soldier? Biomedical innovations allow for areas of the body to be exploited in ways that were previously impossible or barely feasible. The soldier can (possibly) be made to do things and withstand things previously unimaginable, and do so in a (hopefully) controlled, predictable, and survivable way.

As both idiophylaxis and the "Inner Armor" program highlight, militaries have long been concerned with the deleterious impacts of disease and illness on soldiers.[1] Sulzberger was very much aware that this was an old and ongoing concern, and he tried to devise new ways to deal with it. According to his calculations, U.S. military losses due to skin diseases in World War II equaled twelve divisions per day, resulting in the loss of four million "man-days" (his term) over the course of the war (1962a).[2] From Sulzberger's analysis of disease and illness casualties in World War II and Korea he realized that soldiers' "first line of defense" in combat was their own body, which needed to be steeled, hardened, and fortified to withstand the demands of combat in ways heretofore medically and technologically unachievable. For him, idiophylaxis and its suite of internally embedded protective technologies and immunizations would turn the soldier himself into the armor needed to survive on the new post-nuclear and global battlefield.[3]

Sulzberger was writing at a time of immense excitement about the promises of scientific and medical advancements, and he saw the military as a natural area to exploit these for the good of both the military and "mankind" through the development of dual-use medicines and technologies that would enhance human performance and endurance in extreme conditions.[4] Rather than thinking of soldiers as expendable, or as less important than hardware and weaponry, he advanced what was then a radical notion that it was very much in the military's interest to make the soldier into the hardware and the weapon. In effect, he was ultimately arguing for an increased weaponization of soldiers in order to make them more reliable components of new, "syncretic," or even cybernetic weapons systems, fully merging them in a kind of complete, violent embodiment designed to allow them to more easily produce and withstand violence.

[1] For example, see McNeill (2010) for an analysis of the devastating effects of tropical diseases on colonialism and colonial militaries, problems which continue to plague all modern militaries.

[2] There is no evidence that these calculations were contradicted or questioned by the U.S. military, at least according to Sulzberger's papers and reports.

[3] Gender, insofar as it was ever a concern for Sulzberger, was exclusively masculine. His "Component Man" reflected what he saw as the norms of combat in World War II and the 1960s in that it was an overwhelmingly male-dominated activity and the "idiophylactic soldier" was conceived of as male.

[4] For example, see Clynes and Kline (1960) on cybernetics and the U.S. space program.

"MR. DERMATOLOGY": IDIOPHYLAXIS AND THE SELF-ARMORING U.S. SOLDIER

Dr. Marion B. Sulzberger was known as "Mr. Dermatology," and in 1983 he was named the *Journal of the American Medical Association*'s "Dermatologist of the Century." He saw "skin as a source of inspiration from which would flow the answers to many of the important problems of biology" (Goldsmith 2003: v). Sulzberger served in the U.S. Navy during World War I as an aviator and flight instructor. He worked for the U.S. Navy during the Second World War, when he directed a research team that developed and tested materials to protect soldiers against poison gas attacks and studied sensitization to chemical warfare agents (Hoffman 1983; Mackee 1955: 24). He produced over a hundred secret wartime reports for the Navy (Goldsmith 2003: v; Sulzberger Papers 2014).[5] In 1961, Sulzberger was appointed Technical Director of Research, Medical Research and Development Command in the Office of the Surgeon General of the U.S. Army, a position he held until 1964 when he took a position at the Letterman Army Institute of Research in San Francisco (ibid.). While at Letterman Army Hospital and on Guam he directed research on tropical skin diseases, chemical warfare agents, insect repellants, and antifungal creams (ibid.). Sulzberger, who died in 1983, also had a long and successful career as a civilian MD and trained future dermatologists.

A driving force for Sulzberger and his call for idiophylaxis was the recognition of the large numbers of soldiers killed and incapacitated by disease during World War II. While advances in medicine, and specifically military medicine, began to mitigate the effects of diseases and illness, typhoid, malaria, dysentery, and various skin diseases and conditions continued to wreak havoc on soldiers in combat situations (Slotten 2014; Sulzberger 1962a; 1962b; see also McNeill 2010). Military and civilian commanders and strategists recognized the need to develop ways to protect their soldiers from not just the enemy, but also environmental conditions that directly impacted their health and performance. Idiophylaxis, in Sulzberger's conception, involves a broad array of medical interventions to provide "built-in protection" for the soldier: vaccinations, medications, psychological conditioning, and treatments to turn the soldier's skin into "armor." These biomedical interventions envision making a soldier who can better withstand the physical and mental stresses of combat. For Sulzberger, these stresses included the possibility of nuclear, chemical, and biological warfare, conventional warfare and combat conditions, and mundane but militarily important conditions like blisters and rashes that can keep countless soldiers from taking part in combat operations.

At the beginning of his West Point address, Sulzberger made clear what he saw to be the most important and urgent problem facing the U.S. military and

[5] It is unclear how many of Sulzberger's secret reports are still classified.

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the stakes involved in terms of protecting the soldier both internally and externally:

All who have been connected with any aspect of military research and development realize that weapons systems generally consist of three parts: the man, the carrier or vehicle, and the weapon itself. Of these three, man is by far the most complex, most unfathomable and often most fragile.… I believe that man is also the most valuable military component, especially when trained and skilled in the various specialized crafts and intricacies of modern warfare. And, it is not just a matter of belief but one of record that in military campaigns … the component man is the one that fails the most often. Moreover, he most often fails not because of bullets or missiles or any enemy action, but because of the stresses of climate and food and anxiety and disease (1962a: 317).

He elucidated what he and his collaborators meant by "idiophylaxis," and how this differed from standard forms of combat protection:

The improvement and strengthening of the combat soldier's inbuilt self-protection by medical means is one of the central objectives upon which the United States Army's research and development program is focused.… I have given the name "idiophylaxis" to this form of protection….

We include under idiophylaxis every form of protection that can be given to the soldier by preceding mental and physical preparation through medical means. Thus, idiophylaxis includes mental conditioning, the immunizing procedures, the chemoprophylaxis, the medicaments and the anti-bodies which we can cause to be embodied in the soldier's own person. It includes every protective capability with which we can medically endow him so that were he to be stripped suddenly naked, he still would carry substantial degrees of protection with him (ibid.: 128).

Sulzberger then explained the rationale behind his conception of idiophylaxis, and the various forms of protection and biological armor that made up his vision of the new U.S. soldier:

Mental conditioning, i.e. psychic idiophylaxis, has been placed at the very top of my list because of the high priority which must be given to endeavors to equip our soldiers with the mind and the will to resist the terrible stresses which modern warfare brings with it. We must reduce his susceptibility to excessive fatigue and confusion, anxiety and mental breakdowns.… For, when the soldier feels the physical protection which we have been able to confer upon him coursing through his bloodstream or built into his own skin, he knows in his bones that everything has been done to protect him beforehand and everything will be done to help him if he gets into trouble later (ibid.: 321).

He then explicated what he thought was the most important component of idiophylaxis, both for the soldier and for military medical research focused on protecting the soldier on all battlefields (these concerns would be directly addressed later by DARPA's "Inner Armor" program):

Another, and perhaps the most militarily important field of all, is the idiophylaxis which consists in conferring immunity or heightening resistance to various types of infectious disease.… our global effort in this can be divided into three main phases:

1. Gathering from every part of the world information and specimens of diseases which may be encountered there by our soldiers.

2. Research on the causes and carriers of these diseases, their microorganisms and viruses and vectors in laboratory and experimental animals, cell structures, etc., both here and abroad, and,
3. The endeavor to produce immunizing vaccines of all types and their laboratory tests and finally their clinical assays (ibid.).

At the end of his address, Sulzberger laid out why the military had to invest in and develop idiophylactic soldiers:

> In closing, I would like to assure you that we in the medical service are not so starry-eyed as to think that we will ever be able to confer upon the soldier a degree of idiophylaxis which will protect him against all of the attacks of nature or of an enemy, or to make his skin so tough that it will ward off bullets and flames, blast and radiation effects. However, we do believe that we must develop the idiophylaxis of our soldiers to the utmost degree possible, and that we have every prospect of making him in this way the most effective and most resistant of all human beings and thus reduce the vulnerability of the most delicate component of our weapons systems—the trained man (ibid.: 326).

If, as Connerton writes, "flesh both inscribes and incorporates cultural memory and history," then it also inscribes political policy and intentions, military necessity, military history, and military memory (Connerton 1989; see Stoller 1997: 47). From this nexus of memory and national security, new ways of imagining, making, and being a soldier emerge. For Sulzberger, idiophylaxis, a program situated between memory and anticipation, was a response to the medical and operational history and memory of World War II and the theorization and preparation of new forms of protection and of warfare. His notion of idiophylaxis was a call for a kind of visionary, operationalized, medical intervention and research program that was much more active than passive: medical interventions would protect the soldier beforehand in ever more encompassing and efficient ways.

While various forms of external armor were necessary and useful, Sulzberger saw a need to develop a kind of "belief" armor firmly grounded in new biomedical technologies that would always be with the soldier. This belief was anchored in the emergent biotechnological prowess of the United States and a belief that it could both enhance and supersede "boldness" and counter weakness and timidity. Rather than simply dealing with medical issues and disease as they occurred, Sulzberger envisioned an applied military medicine ethos and focus that would utilize cutting-edge technologies and insights to develop soldiers who could "armor" themselves, and thus prevent and mitigate the effects of combat, combat trauma, and disease. The changing nature of warfare was central to his concerns about "manpower": increases in military technology demanded a different kind of soldier. The state needed to better protect soldiers, since they were increasingly costly and time-consuming to train and had come to be seen more as "investments," "assets," and "weapons" rather than mere cannon fodder.

Military performance enhancements are focused on imagining how to make the body useful and mitigating possible future negative influences and

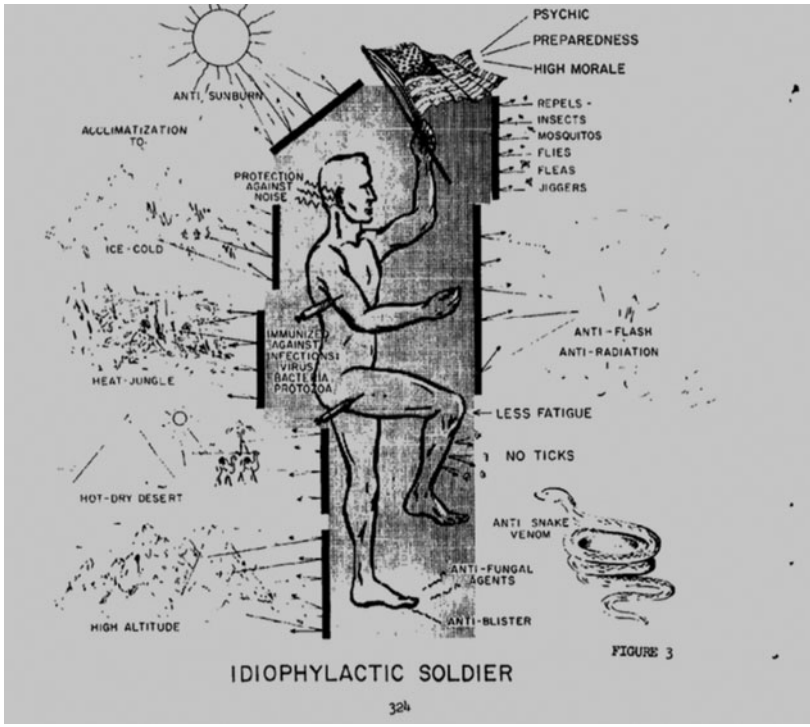

IMAGE 1: "The Idiophylactic Soldier" (Sulzberger 1962b).

stressors on performance. Idiophylaxis would enhance the normal soldier by making him resistant to combat and environmental stressors that unenhanced soldiers could not tolerate. The drive behind modifying or enhancing a soldier is to preclude certain kinds of actions and responses; enhancements are intended to prevent a degradation of ability or functioning, based on anticipated events, stimuli, stressors, and biological/cognitive autonomic responses. If the soldier is the weakest part of the system, then the entire system is at risk. This is not to say that all enhancements are predicated upon a negative; rather, enhancements are about overcoming "normal" responses to things that would inhibit the unenhanced soldier from operating or carrying out a mission. The goal of idiophylaxis was to protect soldiers, not necessarily as human beings, but rather as "military humans." It would increase their dependability, protect the state's investment in the combat and labor power of the soldier, and increase the soldier's utility and durability on and off the battlefield.

For Sulzberger, idiophylaxis was both an internal armor and a form of performance enhancement, since it would allow the soldier to "carry on" and

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continue fighting on the battlefield when normal, unenhanced soldiers could not. His work anticipates and hints at much of the current U.S. military research on biomedicine, psychopharmacology, psychological preparation, and resiliency training (e.g., Gray 1989; 1997; Lin, Mehlman, and Abney 2013; Moreno 2012; Sinclair and Britt 2013; Howell 2014; Jauregui 2015; Robson 2014; Singer 2008). Behind these research efforts is a desire to take the "normal" soldier and make him "more than normal" by applying and incorporating new and increasing amounts of medications and drugs, much like the fictional U.S. Army soldier Steve Rogers during World War II, who becomes the comic book superhero "Captain America" by imbibing "super soldier serum" (Buchanon 2011; Hogle 2005; Singer 2008). While the term "super soldier" is less than precise, it does provide a handy descriptor for thinking about military performance enhancement, a metaphor for the standardization, modernization, medicalization, and implementation of Clausewitz's praise for "boldness."

"BODY ARMOR": SKIN AS METAPHOR, PROTECTION, AND POLITICS

We generally do not link "militarization," "dermatology," and "soldiers" in any kind of semantic or technological chain, nor do we usually associate skin with actual military armor, even if our skin does protect us from the outside world. If these things are ever thought of together, it is usually in terms of skin requiring armor to protect it. We rarely think of skin as military useful or as something that needs to be "militarized" or modified for military use on its own accord.

Sulzberger's focus on skin makes sense in light of his training as a dermatologist and his concern with the effects of combat and the battlefield environment on soldiers' skin. Biological anthropologist Nina Jablonski described this relationship in an interview discussing her work on human skin:

> Skin is the most important interface between [our bodies] and the environment. It bears the brunt of dealing with many environmental stresses—everything from sunshine and wetness to the chemical environment to abrasions and insect bites [to] microbes. It has been scrutinized by evolution to as great if not a greater extent than other organs because it serves this unique function of protection, and yet it must remain sensitive—it can't just be [a] sort of armor plate of protection; it has to be somewhat porous, so that certain things can get in and certain things can't get out. So it's this very interesting, semipermeable, resilient interface, and it has undergone tremendous scrutiny by natural selection in evolution (Jablonski 2011; see also 2004).

While skin cannot simply be a kind of hard, impervious carapace, it does have armor-like properties: "The skin comprises a sheet-like investiture that protects the body from attack by physical, chemical, and microbial agents" (Jablonski 2004: 585). These are properties that Sulzberger was well aware of and sought to exploit for the military. In his vision of the idiophylactic soldier, skin, already a kind of armor, needed only to be converted or augmented into a tougher, more militarily-useful sort of armor to protect the soldier even when other kinds of armor were unavailable or ultimately failed to do so.

In a report titled "*Body Armor*," Sulzberger wrote about the easy supply of body armor at the U.S. military's disposal:

> There is now available a sufficient supply of full body armor satisfying the following specifications: to be negligible in cost; individually tailored to fit; extremely light, elastic, flexible and perfectly comfortable under most climate conditions, durable for life; corrosion, rust, and mildew proof; self-heating, self-cooling; self-thickening in response to repeated trauma and self-repairing in response to acute trauma; self-drying, self-humidifying, self-cleansing and self-sterilizing; practically impermeable to water, to grease and to most harmful chemicals; and equipped with thousands of slender antennae and telemetering systems to warn of approaching danger. For these specifications quite accurately describe the human skin—provided it is healthy and is not subjected to unphysiological and excessive attacks (1962b: n.p.).

In "*Body Armor*," Sulzberger states the importance and necessity of focusing on skin diseases and the need to enhance soldiers' skin: "…there is every reason to hope for better means of using the advances of modern physics, biochemistry, pharmacology, plastic and fabric technology to improve and reinforce soldiers' natural protective armor against the onslaught of heat, cold, moisture, infectious disease, insects, poisons, rays, and trauma" (ibid.: 4).

A September 1962 article by the Walter Reed Army Institute of Research in the *Army Research and Development News Magazine*, titled "Idiophylaxis: A Biological Armor for the Soldier," discussed Sulzberger's work. It explained how skin could serve as armor for the soldier: "By changing the man's chemistry, his skin becomes an effective repellant … pills are under study which would provide immunity from sunburn. Others someday may provide a measure of protection against nuclear radiation" (Walter Reed 1962: 27).

In Sulzberger's vision, the soldier's skin was to be made into a kind of "double" armor, a first line of defense superior to "normal" human skin; it needed to be even more resistant to normal wear and tear and made resistant to things that normal human skin is not. Skin is still the interface, as Jablonski described it, but, Sulzberger said, it is an interface that needs to protect and guard against mission degradation, and it must in fact become a kind of "armor plate of protection" in order to deal with the stresses and experiences and "interfaces" of combat. While evolution had developed it this far, the skin of the soldier needed to be augmented and enhanced through idiophylaxis to fit the needs of military deployments: "Perhaps more important than any of these will be the development of a material which when incorporated in the skin either after local application or when taken by mouth, would make the skin's surface and its secretions repellent to insects, flies, mosquitos, ticks, fleas, etc., and other vectors which are bearers of the most important diseases affecting military operations, including malaria, yellow fever, sandfly fever, hemorrhagic fevers, and so forth" (1962a: 325).

The possibility of nuclear war changed the nature of conventional land warfare and also conceptions of the survivability of the soldier in combat. It also prompted the need to rethink battlefield protection, or at least ways of

convincing the soldier that he was protected. The new operational and medical problems that nuclear war presented to battlefield survival influenced Sulzberger's thinking about soldier protection. He expressed concern about the new forms of injuries presented by the threat of the wide-scale use of nuclear weapons in any conflict with the Soviet Union, and discussed the need to develop ways to change and protect a soldier's skin from nuclear flash burns (ibid.: 326; see also 1962b: n.p.). His idea that skin could be turned into its own armor against "flash burns" and "rays," while fantastical and probably implausible, was an attempt to come to terms with nuclear war and strategize ways of keeping land warfare possible, survivable, and ultimately winnable.

For Sulzberger, the soldier's body was to be the soldiers' own protection, their hardened projection in the world, armored through and through, internally, externally, and psychically, and hardened in accordance with military needs and technological advances. Of course, much of his focus on skin in fact employs skin as a metaphor; as Sulzberger concedes, there is no real way (in 1962, and presumably, now), to *actually* turn skin into a kind of "armor" that affords the soldier protection to every kind of military and environmental threat. Skin can be fortified and strengthened and protected in certain ways against certain environmental factors and agents, and against some kinds of physical injuries. Again, in his formulation of a kind of biomedical "belief armor," the trick is to make soldiers think that their skin is a suit of armor, and not simply their unenhanced body, naked against the world. Soldiers are to think of their bodies not as just their own, but rather as the state, armored and made indestructible by the state's biotechnical capabilities, their safety vouchsafed by its directed interventions in their bodies.

THE COLD WAR, MILITARY MEDICINE, AND RETHINKING THE "COMPONENT MAN"

Sulzberger wrote and theorized at a time when the Cold War, with its concomitant arms race and the space race—actually a broader technology race with the Soviet Union—was in full swing. After the successful launch of Sputnik in 1957 there was a growing fear in the U.S. defense community of a widening military and scientific technology gap with the Soviet Union. As each side prepared for war, the search for new ways of gaining any kind of military edge became a crucial national security concern. For Sulzberger, advances in military medicine and technology would enable the military to deal with medical concerns it had been unable to cope with during World War II, and to address and ameliorate operational and deployment concerns and potential problems brought about by the increasingly global battlefield of the Cold War and the Warsaw Pact's material superiority over NATO forces. Given the disparity in the size of NATO versus Warsaw Pact forces in terms of soldiers and material, NATO forces had to imagine and develop innovative ways to do more with fewer soldiers, and keep those soldiers it had in the field combat

ready and capable for longer periods. As Sulzberger saw it, the embedded biomedical solutions of idiophylaxis, and military medicine and new biotechnologies in general, would be the "force multipliers" of the Cold War, and the body of the U.S. soldier would increasingly mimic the high-tech solutions in military hardware favored by the U.S. military.

The primary confluence of national security and science during the Cold War centered on major weapons projects and research, with "soldier-centric" research holding a second-tier position. Sulzberger's call for a focus on the soldier as a key priority of Cold War military scientific research ran counter to the prevailing interest in "big science" projects like nuclear weapons or other major weapons platforms (see Creager 2014; DeLanda 1991; Edwards 1996; Gusterson 1996; Masco 2006; Oreskes 2014). He tried to put soldier-centric biomedical research on par with the "big science" national security prestige projects. He knew that weapons systems needed to be robust, but if soldiers could not keep up with the demands and stresses produced by those systems, then the systems would be fairly useless. Military biomedical research would have to address and overcome the stressors to the "component man" that take soldiers out of action. Describing science in general during the Cold War, Forman wrote that it "effectively rotated … towards techniques and applications" (Oreskes 2014: 21), and this applies to the sorts of research Sulzberger advocated. Idiophylaxis was to be a suite of directed and applied interventions and applications designed to prevent the "component man" from failing on and off of the battlefield, which would also give the military and politicians confidence that soldiers would not fail.

Rather than the slower, fits-and-starts evolution of military technology and improvements in soldier protection of previous centuries, the twentieth century and especially the period after World War II saw an exponential growth in biomedical protective capabilities and possibilities, which Sulzberger recognized and highlighted in his idea of idiophylaxis. He explained why military medical research was of the utmost importance to national security, and how it differed from civilian medicine and medical research:

> We, in the medical service, who are responsible for the effectiveness of the component man are faced with Buck Rogers-Alice in Wonderland advances in technology; exponential expansions of scientific and medical knowledge; kaleidoscopic rearrangements of policies and plans; rapid-fire introductions of new kinds of weapons, new kinds of transportation and communication, actual and potential dispersion of combat and special forces throughout all regions of the globe; and our troops' consequent unbelievably sudden and rapid encounters with new types of hostile climates and environments, new types of animals, poisons, vegetation, microorganisms, virus, and other causes of disease. These new conditions bring with them constantly new and constantly waxing stresses upon the capacity of our men to perform with reliability and effectiveness. They also present constant challenges, as well as opportunities for medical and scientific research (1962a: 317).

This was Sulzberger's prescient realization, still valid today, that the speed at which soldiers could and would be enhanced was rapidly accelerating. He saw military medicine as a unique and increasingly important area of military technology and research, and one that, while similar to civilian medicine in many ways, differed in both mission and focus:

> The soldier's reliability, his mental and physical health, cannot be maintained except by a specially oriented military medical research and development program which is directly geared to every advance of science and at the same time rapidly responsive to the ever changing military needs … despite the many vast and varied programs of civilian medical research, there remain medical problems which are not now and will not in the foreseeable future be investigated by any civilian agency with a vigor commensurate to the magnitude and immediacy of the threats they pose to our Army's successful operations (ibid.).

As Sulzberger makes clear, military doctors and biomedical researchers are not tasked simply with maintaining the health and wellbeing of soldiers, even if this is an important part of their jobs. Their job is also to produce, monitor, and intervene, and to incorporate technology *in* soldiers as a way to promote and enhance combat their effectiveness, survivability, and readiness, and keep them healthy, well, and in a state or readiness when not in combat. This point is clear in the motto on Army Medicine identification badges: "To Conserve Fighting Strength."[6] Combat readiness and the operational needs of the military come before the "personal" medical needs of the individual soldier.

IDIOPHYLAXIS, THE MAN-MACHINE, AND THE NAKED WARRIOR

While Sulzberger's idea of idiophylaxis emerged during the Cold War, it should also be understood as a part of broader twentieth-century trends, concerns, and imaginations of a "machine-like" body that is resistant to stress and able to provide substantial labor. This was the body stripped of adornment, strong, alert to threats and danger, invincible on its own accord, predictable and efficient, "up to the task," and "ready for action." Rather than just relying on soldiers as they found them, militaries could start to imagine ways to manipulate them and shape them in ways previously unimaginable or unattainable. The soldier's body could through technology and medicine be made to fit the ever-growing needs of a military, and new forms of weapons technology could be developed based on changes to the capabilities of the human body. The soldier would in many regards become the weapons system, be seen as a system (the "system man" in Sulzberger's phrasing), and fitted into a "system of systems" (see Bickford 2008; Ford and Glymour 2014; Martinez-Lopez 2004). In essence, idiophylaxis, the "armored" body, and human engineering are about imagining and designing a certainty and predictability of performance of a body armored against weakness and ensuring

[6] I thank one of *CSSH*'s anonymous reviewers for bringing this to my attention.

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boldness, and of extracting as much labor and effort from soldiers as possible without "degrading" their ability to actually function. As part of the U.S. military's growing Cold War reliance on and fetishization of game theory, engineering logic, cybernetics, and algorithms, idiophylaxis marks the emergence of an early systems engineering/cybernetics-meets-biomedicine approach to designing soldiers (see Clynes and Kline 1960; DeLanda 1991; Edwards 1996; Erickson et al. 2013; Gray 1989; 1997).

Metaphors of the "man-machine," the "armored body," and "human engineering" were all part of much wider cultural, technological, industrial, and aesthetic trends in Europe and the United States during the late nineteenth and early twentieth centuries, which focused on the mechanization of the body, the body-as-machine, and the body transformed by modernity, the needs of industrialization, and the application and incorporation of technology (Biro 1994; Boscaglia 1996; Rabinbach 1992; Spotts 2004). There were other conceptions of the internally armored soldier, like the German artist Arno Breker's massive sculpture for the Nazi party, *Bereitschaft* (Readiness), the armored body of the Italian Futurists, and the "super soldier serum"-imbibing Captain America. All of these conceptions and representations of the armored body were already circulating in the post-World War II cultural imaginary and can be seen in Sulzberger's conception of the "idiophylactic soldier" and its "Buck Rogers-like" possibilities.

Idiophylaxis was a part of the logic of modernist technological development and advances, and ongoing attempts to improve capabilities and counter those of the enemy in an age of increasingly mechanized warfare. But in a key regard it goes much further in embedding even more biomedical technology in the body of soldiers, in preparing them for multiple contingencies rather than on an ad hoc basis. Rather than simply relying on "boldness" to insure success on the battlefield, idiophylaxis would augment willpower and belief and provide some certainty of performance through embedded protection. This continuum points to the ways in which metaphors of the "armored body" and the "man-machine" become both literal and applied over time, partly ideological and partly productive.

A striking inclusion in Sulzberger's notion of idiophylaxis was his discussion and vision of a kind of technological primitivism, of the soldier stripped down to his skin, naked and alone on the battlefield, seemingly unprotected and unarmored, yet still powerful and undeterred (again, reminiscent of Breker's "Readiness"). Sulzberger's future soldier would be firmly locked in an image of the past while embodying the technology of the future. At first glance, this seems to run counter to ideas of soldiers and body armor, but it makes perfect sense when the body, as Sulzberger saw it, was already a kind of natural armor that could be made even stronger with the right suite of interventions. As he put forth in his address, his vision was to develop technologies for the soldier so that "were he to be suddenly stripped naked, he still would

carry substantial degrees of protection with him," and would retain a kind of innate armor and self-protection through vaccinations and other drugs and medications (1962a: 320): "I would like to emphasize that every protective measure with which we endow the soldier's body also contributes greatly to his mental idiophylaxis and his effectiveness and confidence. For, when the soldier feels the physical protection which we have been able to confer upon him coursing through his bloodstream or built into his own skin, he knows in his bones that everything has been done to protect him beforehand and everything will be done to help him if he gets into trouble later" (ibid.: 325).

"Nudity" and biological armor also present the military with an extremely important logistical advantage: "All of these ideas have inherent the built-in, self-protection concept. All have the possibility of being controlled through medical knowledge. They have very great promise for very large savings in Army logistics. They do not require additional weight for the soldier to carry into combat; they do not require additional volumetric space in the ships or aircraft serving as supply lines overseas; they are part of the soldier—wherever he goes (Walter Reed 1962: 27)."

Conceptions of the "naked warrior" revolve around notions of strength and weakness. Nudity, and the full exposure of the skin, is often associated with weakness, helplessness, and vulnerability (Norman Mailer's 1948 war novel, *The Naked and the Dead*, explores this connection), but it can also be associated with strength and authenticity (Jablonski 2004: 6; Spotts 2004; see also Deakin 2014). Nudity also implies a kind of "blank slate," a body ready and open to manipulation and enhancement, tailored to specific goals or prepared for a broad array of possibilities, and devoid of equipment. For Sulzberger, the "naked warrior" was a soldier who would be able to carry on and function on the battlefield because the blank slate had already been prepared and enhanced, confident in his own enhanced skin, knowing and feeling in his bones that the state is protecting him. The soldier is his own biological armor, encased in his own enhanced suit of "body armor."

As Sulzberger makes clear, the embedding of technology/medicines in soldiers would serve to protect them, but perhaps most importantly, soldiers would know and feel that they were protected, that they were still supported and somehow not alone because of the sheer amount of technology "coursing through [their] bloodstream." Soldiers could continue to rely on the military, even if naked and alone, because they would know that the military had enhanced their bodies to continue to provide protection even with no other kind of armor. In some ways, the "insulated" body of the idiophylactic soldier mimicked the Cold War U.S. obsession with "insulation" and a "closed world" of defense (see Edwards 1996): a state and a body insulated from the dangers of the world, armored from the inside against attacks and threats from the outside, the skin/borders presenting a (largely imagined) impermeable barrier.

"BETTER WARRIORS THROUGH CHEMISTRY," "SKIN-IN-SOLUTIONS," AND "THE FORCE"

We can draw a line connecting Sulzberger's idea of "idiophylaxis" and today's representations and plans for "super soldiers," "Inner Armor," and "Iron Man Suits"—the idea of the armored and self-armoring soldier who can resist battlefield and environmental conditions, who is seemingly indestructible and "surgically" clean of the horrors of war, both during and after conflict. We can also see a link in terms of military biomedical and scientific research, funding, and patronage, and the application of cutting-edge science to military problems, either contemporary or imagined for the future. The "governmentalization" of science, as Edward Shils referred to it in 1972 (Shils 1972; Aronova 2014: 394; Weinberg 1996), is today represented by military biomedical research and research agencies and sites, such as the Defense Advanced Research and Projects Agency (DARPA), the United States Army Research Institute for Environmental Medicine (USARIEM), the Natick Soldier Center, and the Oak Ridge National Laboratory, not to mention the many military-related biomedicine projects conducted through universities and private firms. Some of the military performance-enhancement projects currently underway in the United States include trauma-blocking drugs for soldiers in combat; interventions in the "sleep/wake cycle" designed to keep soldiers on the go for 72 hours; specially designed performance-enhancing foods; hyper-hydration; new protective and information technologies; research into pharmaceuticals designed to "enhance situational awareness" and prevent the "degradation of decision making"; and military applications of synthetic biology. Such projects represent a move from the relatively small-scale soldier-centered biomedical research of Sulzberger's era to "big science" projects that Sulzberger could only dream about in the early 1960s. The soldier (or currently, the "warrior" or "warfighter") is now a key component of "big science" research, and the protection and wellbeing of soldiers is military, politically, and economically important in ways that Sulzberger might have found surprising, but most welcome.

Sulzberger's ideas for "built-in protection" continue to influence and course through research programs in the U.S. military, and we can use them to think about and analyze current U.S. military projects designed to protect and enhance soldiers, be they biomedical, pharmacological, psychological, or cybernetic. As stated in the "Army Medical Science 2004," the problem of certainty of performance in combat is being addressed by "novel neuroprotective drugs," and it says that a "recurring finding" is that "biotechnology offers major payoffs to the military in improved soldier health and performance" (Army Medical Science 2004: 2). According to the former chief of the U.S. Navy's operational testing and evaluation, Rear Admiral Stephen Baker, "Futurists say that if anything's going to happen in the way of leaps in technology, it'll

be in the field of medicine … this 'better warrior through chemistry' field is being looked at very closely" (Knickerbocker 2002).

Sulzberger's concern with the "naked soldier" and "skin," and the need to internally armor the naked soldier, appear in later U.S. military research. Mimicking his early work and focus on skin, current U.S. biomedical programs are described by U.S. military researchers as "skin-in solutions to the better war fighter" (Military Operational Medicine Research Program 2004; Bickford 2008). Section Q of the 1998 United States Department of the Army Science and Technology Master Plan (AMSTP) provides the underlying objectives and goals of U.S. military biomedical research:

> Military Medical and Biomedical Science and Technology programs are a unique national resource focused to yield superior capabilities for medical support and services to U.S. armed forces. Unlike other national and international medical and biomedical S&T investments, military research is concerned with preserving the combatant's health and optimizing mission capabilities despite extraordinary battle, nonbattle, and disease threats. It is also unlike most of the more widely visible Army modernization programs because its technology is incorporated in service men and women rather than into the systems they use (United States 1998: Q1).

A later article by U.S. Army Colonel Karl E. Friedl (then commander of USARIEM) and Jeffrey H. Allan (then Chief of Staff, USARIEM), stated that the Institutes' aim was "to conduct biomedical research to protect the health and performance of Soldiers in training and operational environments. This largely involves "enhancement" of the soldier capabilities by preventing the degradation of health and performance in the face of external stressors that may include the natural environment or manmade exposures, including our own material systems" (Friedl and Allan 2004: 33).

A 2001 report from the Oak Ridge National Laboratory on the U.S. military's "Objective Force Warrior" project echoes Sulzberger's interest in soldiers stripped bare or who might find themselves naked on the battlefield. While the Objective Force Warrior report does not name or cite Sulzberger directly, it references the "naked warrior" and discusses the need to think about the soldier devoid of "skin out" technology (technology worn on/outside of the body) who would have to rely on "skin-in" technologies and enhancements (biotechnologies embedded in the body): "The [research] group then took the unique approach of starting with what they called the "Naked Warrior"—a warrior with no individual equipment or systems. Their logic was that before you could add technology to a warrior, you had to have a cultural strategy. Throughout all of the deliberations, they kept coming back to the concept of the Naked Warrior. There was a consensus that if the warrior did not have certain attributes, the addition of technology would not prove beneficial (National Security Directorate 2001: 2).

A vision similar to Sulzberger's of the complete protection and insulation for the isolated soldier and the "technological embrace" of military

enhancement programs was depicted by General Paul Gorman, when he described the "The Objective Force Warrior":

> The soldier of today is thrust far forward.
> He is the point of the Army spear.
> It is very lethal and lonely out there.
> The soldier of tomorrow will never be alone.
> And he will advance on his enemy shielded by dominant information.
> His leaders will be able to say to him:
> Soldier, you are the master of your battlespace. You will shape the fight.
> The network will enable you to see all that can be seen. You will out-think, out-maneuver, and out-shoot your enemy.
> The Force is with you.
> You are one with the Force (ibid.: 8).

The idea that the soldier is "one with the Force" is similar to Sulzberger's contention that soldiers will always feel protected and never alone, if they know they have been given and embody a suite of protective technologies that will allow them to survive the battlefield. "The Force," like the mysterious "Force" in the Star Wars film franchise that empowers the Jedi Knights by flowing in and around and through their bodies, is a triple entendre of the state, the military, and the full weight of the military biomedical and technical development communities embracing and enmeshing the soldier.

IDIOPHYLAXIS REDUX: DARPA'S "INNER ARMOR" AND THE "KILL-PROOF SOLDIER"

DARPA is the U.S. government's premier funding and development agency for pioneering military research projects. Tasked with backing and developing the technology that will keep the U.S. military far ahead of potential rivals (and fully expecting 90 percent of the projects that it funds to fail), DARPA has shown a keen interest in developing protective technologies for soldiers through programs like "Land Warrior," "Objective Force Warrior," "Future Force Warrior," "Future Combat System," and "Army Brigade Combat Team Modernization."

In 2007, Dr. Michael Callahan, Program Manager of DARPA's Defense Science Office, gave a talk entitled "Inner Armor" at "DARPATech," DARPA's 25th Systems and Technology Symposium in Anaheim, California. His talk bears a remarkable resemblance to Sulzberger's description of idiophylaxis and the dream of the idiophylactic soldier:

> We have made extraordinary advances in the *external, physical armor* that protects our Soldiers from most of the enemy's weapons. There is one flank that remains unprotected, and it is this gap that is responsible for continued unacceptable levels of morbidity, illness, injury and death. Not ALL of the threats encountered by our deployed Soldiers are inflicted by the enemy. The dramatic increase in the number of exotic, primitive and tropical battlefields brings the modern military into extreme contact with the world's most hostile environments—and most dangerous threat agents. As a DARPA program manager and physician-scientist, it is my vision to address all of these

threats, and to leave NO PART of the soldier unprotected.… It is my goal to provide our men and women with an *unfair advantage* over the enemy. In the next 2 years, I am developing technologies that will extend the soldier's personal protection beyond bullets and bombs, to include protection against environmental threats, infectious diseases and chemical, biological and radioactive weapons. The effort will require orthogonal strategies to harden the warfighter against extremes of temperature … to rapidly adapt Soldiers to high altitude, to blue water operations, to prevent infection before it occurs, and to protect the soldier against new-generation weapons of mass destruction. The objective is to fortify the *entire* soldier against attack from the enemy—or from the environment. I call this comprehensive protection *Inner Armor* (Callahan 2007: 2).

In his address, Callahan called for soldiers who would be protected against environmental threats, disease, and infections in much the same manner as the idiophylactic soldier. Again, in both idiophylaxis and "Inner Armor," "nature" and the "enemy" are both the enemy. However, unlike Sulzberger, whose vision was much more modest (at least by today's standards), Callahan envisions "kill-proof" soldiers:

The second focus area in Inner Armor that I want to share with you is Kill-Proofing. As of today, our Soldiers are vulnerable to diseases to which the enemy is immune. When a single soldier is infected, the mission is jeopardized and often, terminated…. Let's first look at ways to "kill-proof" our Soldiers against chemical and radioactive weapons. Over the last 2 years, surveillance studies of the world's most toxic places, including nuclear waste and chemical weapons dumps, reveal that these ecological niches are teeming with life. The organisms growing in these areas have developed compensatory biological mechanisms to deal with radiation and chemical toxins…. It is our intention to mimic these natural successes in the human body by producing synthetic vitamins and safe preventive drugs that will forestall the onset of radioactive and chemical injury.

Throughout recorded history there has been no greater natural threat to the soldier than infectious diseases…. Today's military vaccines only protect our Soldiers against 7 of the 44 highly dangerous pathogens that our Soldiers encounter in today's conflict zones.… I envision that we will pre-position universal immune cells that are capable of making antibodies that neutralize tens, perhaps hundreds, of threat agents. Imagine that in the future, a universal immune cell can be quickly given to any non-immune soldier who is going into harm's way, which will provide stand-by protection against any tropical infection, or agent of bioterrorism… We must also work to make our men and women kill-proof against infectious disease, radioactive and chemical threats delivered from intentional man-made or natural sources (ibid.: 11).

The move from "idiophylaxis" to "Inner Armor" displays continuities in rhetoric and focus, but it shows the evolution in technological possibilities and the fantastic imagination of how soldiers can be enhanced and protected. It also traces a kind of arms race of the fantasy super soldier: where Sulzberger (merely) envisioned self-armoring, DARPA sees a kind of deathlessness, which promises continued and repeated deployments. This reflects the reality of current U.S. military deployments: with the Global War on Terror, U.S. Special Forces operate in at least 125 countries around the world, and the military is stressed and strained by multiple deployments. The military needs soldiers to be able to do more, not break down from stress, and survive the rigors

of multiple deployments.[7] As the 1998 United States Department of the Army Science and Technology Master Plan (1998: Q1) explicitly stated, "High casualty and death rates are war stoppers" (United States ASTMP 1998: Q1).

Metaphors and fantasies of the internally armored body help shape the way the military, policy makers, and the public think about soldiers and their performance, and help drive research foci and agendas concentrated on protection. "The Idiophylactic Soldier," recent U.S. Army recruiting slogans like "An Army of One," and "There's Strong, and then there's Army Strong," and DARPA's "Kill-Proof Soldier" are all metaphors for enhanced "super soldiers," protected and ready and able to fight, win, and survive.

We need to consider what the drive to produce enhanced military bodies means for theorizing militarization, security, and military solutions to conflict, and how the ongoing push to develop "super soldiers" might preclude the possibility of imagining non-military solutions to global crises. Metaphors of soldier protection might lead to a politics of acceptance of and acquiescence to military intervention and action, a politics of military support underpinned by the claims of technological enhancement and protection promised by military biotechnology and belief in "super soldiers."

If we can start to imagine and see skin as "armor" and soldiers as "kill-proof," we can begin to imagine soldiers that are more protected than they really are, capable of more than they really might be, and part of a military that can accomplish tasks and political goals it might not be able to accomplish. If soldiers are seen as "kill-proof" and war is thought to be "clean," then it may become more difficult for policy makers to imagine non-military solutions to global crises. "Super Soldier" research might be a way of deferring arguments against the first-choice option of warfare: if we could only make soldiers "kill-proof," we could make military interventions and war potentially "lose-proof." Idiophylaxis, "Inner Armor," and military performance-enhancement projects are as much a kind of ideological/political armor as they are biomedical armor.

THE MILITARY BODY PROBLEM: WEAKNESS AND STRENGTH, BOLDNESS AND BIOLOGY

Clausewitz's discussion of weakness and boldness helps frame the problems Sulzberger and later military biomedical researchers have faced, which must be overcome in order to produce "bold," useful, and deployable soldiers. In the eyes of the U.S. military, the human body is seen as a limiting factor in the prosecution of war, the basic weakness being the tendency of the "component man" to succumb to illness, fatigue, and trauma. Biomedical research will help the military learn to make the body do what it might not normally be able

[7] A report published by The Project for the New American Century (2000), titled *Rebuilding America's Defenses: Strategy, Forces and Resources for a New Century*, envisioned enhanced soldiers playing a key role in both conventional and anti-terror warfare.

or even want to do. Where once the body could have been considered its own limit in the prosecution of war, through biomedical means the body is to lose its self-limiting potential and allow for the continuous escalation of war through the steady application of biomedical technology to sustain it. Overcoming the weaknesses and basic biology of the soldier allows for the deployment of the soldier; it is the reconfiguration of the soldiers' own bodies to make them deployable, to promote boldness and readiness. In this conception of military health, the body is to cease being a limiting factor in the prosecution of war.

In both Sulzberger's and the U.S. military's conceptions of the body of the soldier, it is at once powerful and weak, menacing and menaced. It must be strong enough to be deployed to counter any threat, yet weak and threatened enough to require constant supervision and enhancement. Weakness is what drives a military, during both war and peace: the need to search for enemies' weaknesses and to constantly be on guard for your own, and be aware of your potential shortcomings, flaws, and blind spots. Weakness equals intervention; power must spiral around and in the body of the soldier, constantly defining and redefining it, testing it, and stressing it. The body is not only the "inscribed surface" of events (Foucault 1979; 1980), but also the inscribed and regulated interior of events. The soldier's body must be constantly prodded to expose its weaknesses, down to the molecular level: only then can the military know what a body might be able to do on the battlefield. As the U.S. military Basic Training adage goes, "pain is just the weakness coming out." Finding, expunging, and armoring against pain is the crux of a military biopolitics of protection.

This biopolitical interior regulation is crucial to external politics and warfare, and the health of the soldier in many ways becomes, and is, the health, security, safety, and protection of the state. As a military medical researcher, Sulzberger was well aware of the importance of this connection, and he closed his West Point address by echoing John F. Kennedy's message to Congress in 1962: "The basic resource of a nation is its people. Its strength can be no greater than the health and vitality of its population. Preventable sickness, disability, and physical or mental incapacity are matters of both individual and national concern" (1962a: 327, referencing Kennedy's address to Congress on 27 February 1962).

For Sulzberger, only the internal reconfiguration of the soldier could make the soldier healthy, strong, and tough enough to withstand modern combat; soldiers would have to be made to fit the war. Idiophylaxis and "Inner Armor," and military performance enhancements in general, are the medicalization of national security concerns, carried out in, on, and through the bodies of soldiers.

THE LEGACY OF IDIOPHYLAXIS: PROTECTION, ENHANCEMENT, PRODUCTION, AND DEPLOYMENT

The idiophylactic soldier of the 1960s can be seen as the prototype of an emergent hi-tech, "flexible" soldier, made on an "as needed" basis for each and

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every contingency. This new type of "flexible" or "modular" soldier would be a soldier who could be fitted quickly into every new political and environmental contingency, a soldier based on a kind of bio-modular production ethos that would build upon a standard, common platform—the soldier's body—and adapt that body when and as needed. In their discussion of the military application of neurogenomics, Killion, Bury, Pontbriand, and Belanich state, "The emerging knowledge base will enable us to design technologies and systems with the Soldier as the operational platform" (2009: S12). This is the "Soldier-System" and the "Soldier as System of Systems" of contemporary U.S. military parlance. We can think of this evolution of protection technologies as a desire for soldiers/platforms that can be adjusted, altered, and enhanced on an as-needed basis, anywhere and anytime.

Idiophylaxis and DARPA's "Inner Armor" are terms of both material and ideological production, and are simultaneously research, development, and production ethea and metaphors for the "improved" soldier and the high-tech military, the soldier carrying the cutting-edge technology of the state in his body. The enhanced soldier is a body that represents, and is, the hi-tech state of the state on the battlefield. In 1962, Sulzberger's "idiophylactic soldier" was to be the super soldier of the day. Today, super soldiers might refer to DARPA's "kill-proof" soldiers we imagine using exoskeletons, liquid metal armor suits (i.e., DARPA's "Tactical Assault Light Operator Suit" [TALOS]), and drugs such as Propranolol that (might) block traumatic memories (Lin, Mehlman, and Abney 2013). They are supposed to perform like mythological warriors or comic book superheroes.

Sulzberger's work and DARPA's later iteration of it do something else important: they expand our ideas and understandings of what military performance enhancements and immunizations are and what they are supposed to protect against. Preventing illness and mundane afflictions like blisters, rashes, and dysentery is just as much a part of imagining and making enhanced soldiers as is creating soldiers with superhero-like abilities. As both idiophylaxis and "Inner Armor" imply, the development of an enhanced immune system and body that can heal and protect itself—a kind of biological optimization—is the first step in creating super soldiers. It is the "platform" upon which all other technologies depend. This point is often lost when we imagine super soldiers, but the mundane is just as militarily important as the marvelous when it comes to designing the soldier of tomorrow.

The recent and ongoing wars in Iraq and Afghanistan, and the "war on terror" that sends U.S. soldiers around the globe, continue to highlight the mental and physical frailty of soldiers, and the devastating consequences of combat on soldiers who survive multiple deployments (Finley 2011; Hautzinger and Scandlyn 2014; Messinger 2010; Wool 2015). While recent wars have highlighted the remarkable advances of military medicine, they have also revealed a major flaw in the post-1973 Abrams Doctrine U.S. military:

how exactly do you keep a volunteer military that was designed for a short, devastating conflict with the Warsaw Pact in combat for over a decade? How do you keep soldiers mentally and physically fit and healthy after multiple combat deployments? How do you keep an entire military force from medically falling apart? As Sulzberger alluded to, war is too important and overwhelming to leave to unenhanced soldiers who, more often than not, break down and "fail."

Situations "in the moment," such as the Cold War, or the wars in Iraq and Afghanistan, present certain kinds of military problems and demand certain kinds of responses and solutions. If contingencies require responses, how are bodies reconfigured and soldiers designed and remade to shape a response? Contingencies compel the military to think about what a body can do, what it can be made to do, and how technology will be employed to make soldiers do and survive the previously unimaginable. We can look at the types of enhancements Sulzberger proposed—"idiophylaxis," "psychic idiophylaxis," and "chemophylaxis"—and use them to think about military performance enhancements and the links between the soldier and the macro-level political, military, and economic processes and contexts of military biomedical innovation.

We can also examine these projects to consider the debates occurring in military bioethics circles about what constitutes permissible enhancements to soldiers (see Annas and Annas 2009; Ford and Glymour 2014; Gross 2006; Lin, Mehlman, and Abney 2013; Moreno 2012; Singer 2008; Tracy and Flower 2014). We can begin to pose working hypotheses about why certain enhancements are chosen at specific times. For example, it is well established that political, economic, and military rivalries and tensions drive military science and biomedical research, but what does all of this mean for the soldiers or soldiers-to-be and their families? What will this mean for military recruitment, and the race, class, and gender issues associated with joining the military? What are the biomedical and technological possibilities at a given moment, versus imagined or desired interventions or enhancements? Is an enhancement the ex post facto biomedical realization of a political/military crisis? Do these political tensions ultimately end up as "translated" embedded technologies in the bodies of soldiers? What might it mean to be an enhanced, idiophylactic, "kill-proof" soldier? What if the enhancements and protections do not work as promised? And what happens to the "kill-proof" soldier after war and combat are over and they try to return to civilian life (see Lin, Mehlman, and Abney 2013; Singer 2008)? We might be able to biomedically design, engineer, and manufacture "bold" soldiers, but what then? Idiophylaxis and "Inner Armor" might help a soldier survive war, but will they help a soldier survive peace? In the mythology of the heroic warrior, the hero often finds it difficult or impossible to return home (see Bickford 2010a; Hautzinger and Scandlyn 2014; Shay 1995).

Sulzberger's idiophylaxis never became a completely funded, independent research program, and he later left his military research position and returned to private practice. Many of the recent projects I have described have been only partially successful, have failed, or have simply been cancelled due to budget constraints and cost overrides (see Jacobson 2015; Weinberger 2017). However, we should not see any of this as a failure, or assume that idiophylactic super soldier research is a dead-end, no-win endeavor. Far from it: cancelled projects often continue on in different iterations of new projects; each "failure" drives new endeavors and highlights new areas to explore and exploit. The dream of the "kill-proof" soldier—which might constitute the benchmark of success in super-soldier research—spurs continued research and development in the ever-increasing field of military biomedicine (see Masco 2014). Biomedical research predicated on soldier protection and enhancement provides jobs, funding, and the circulation of resources, and like "Support Our Troops," soldier protection is a political "third rail" in the United States that is hard to fully counter (see Jacobsen 2015; Weinberger 2017).

Completely idiophylactic, "kill-proof" soldiers do not yet and may never exist. But the dream of harnessing the bodies of soldiers in ways once thought impossible in order to make them ever more "bold," useful, and powerful for the military seems to have its own kind of "kill proof" inner armor that protects policy and procurement. "Idiophylaxis" may no longer be part of the military lexicon, but the concerns, drives, pressures, and metaphors Sulzberger detailed to imagine and produce idiophylactic soldiers are alive and well in U.S. military biomedical enhancement programs.

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Abstract: All militaries try to develop a "winning edge" in warfare. More often than not these attempts focus on new weapons systems and weapons platforms, on new ways of maximizing the offensive capabilities of a military through firepower. These attempts can also involve the training and development of soldiers, including performance enhancements to make them fight better, longer, and smarter than the enemy and to counter human frailty on the battlefield. These concerns and problems have long held the interest of the U.S. military. This article traces the development, rationale, and legacy of one such attempt to deal with human frailty and the "body problem," a kind of military futurism devised at the peak of the Cold War. Dr. Marion Sulzberger envisioned creating soldiers who had their own kind of special "biological armor," or what he termed "idiophylaxis." In 1962, he presented a paper at the Army Science Conference at West Point titled "Progress and Prospects in Idiophylaxis (Built-In Individual Self-Protection of the Combat Soldier)." Sulzberger's call was for a radical rethinking of the combat soldier and the ways in which soldiers were imagined, designed, and developed. His goal was to "armor" the individual soldier both internally and psychologically through new forms of biomedicine and biotechnology. The interventions he detailed in 1962 live on today in the U.S. military's soldier performance enhancement research programs, including DARPA's recent "Inner Armor" program and desire to make "kill-proof" soldiers.

Key words: military, militarization, biomedicine, performance enhancement, soldier's body, military medicine, military bioethics, history of medicine, Marion Sulzberger