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PI: <b>MEHLMAN, MAXWELL J</b>	Title: Ethical, Legal, and Social Implications in Military Genomics	
Received: 06/14/2011	FOA: PA10-064	Council: 01/2012
Competition ID: ADOBE-FORMS-B1	FOA Title: NIH SMALL RESEARCH GRANT PROGRAM (PARENT R03)	
<b>1 R03 HG006730-01</b>	Dual:	Accession Number: 3401072
IPF: 218601	Organization: CASE WESTERN RESERVE UNIVERSITY	
Former Number:	Department: The Law-Medicine Center	
IRG/SRG: ZRG1 HDM-T (90)M	AIDS: N	Expedited: N
Subtotal Direct Costs (excludes consortium F&A) Year 1: 50,000 Year 2: 25,000	Animals: N Humans: N Clinical Trial: N Current HS Code: 10 HESC: N	New Investigator: N Early Stage Investigator: N
<i>Senior/Key Personnel:</i>		
<i>Organization:</i>		
<i>Role Category:</i>		
Maxwell Mehlman JD	Case Western Reserve University	PD/PI

## ELSI in Military Genomics R03 – Mehlman, M.J.

### **Project Summary**

Advances in genomic science are attracting the interest of the U.S. military for their potential to improve medical care for members of the military and to aid in military recruitment, training and specialization, and mission accomplishment. In addition, large DNA banks operated by the military could be a valuable resource for military and civilian researchers. While ELSI research projects have explored issues raised by the use of genomic science in a wide variety of contexts, there has been virtually no examination of the ethical, legal, and social issues raised by military genomics beyond those relating to forensic use of the Department of Defense (DoD) DNA Registry.

This project will bring the insights from the ELSI program and the broader conversation on the ethical, legal, and social issues posed by genomic science in general to bear on the unique challenges presented by potential uses of genomic science by the military. Building on work now underway to develop a bioethical framework for military bioenhancement, this project will construct the first bioethical and legal framework for military genomics, and will employ this framework to analyze how ELSI issues might be resolved.

ELSI in Military Genomics – Mehlman, M.J.

### **Project Narrative**

This project will construct an ethical and legal framework for military genomics and apply this framework would apply to uses of genomic science contemplated by the U.S. military. This will promote the public health by elucidating ethically and legally appropriate ways to construct and utilize a proposed new military/VA DNA biobank, and by offering suggestions for how to protect the health and well-being of members of the military and their families as the military increases its uses of genomics.

### **Facilities and Other Resources**

The Law-Medicine Center is located on the second floor of Case Western Reserve University School of Law. It features computers, telephones, fax machine, and photo copiers.

## PHS 398 Modular Budget, Periods 1 and 2

OMB Number: 0925-0001

<b>Budget Period: 1</b>				
Start Date: <input type="text" value="04/01/2012"/>		End Date: <input type="text" value="03/31/2013"/>		
<b>A. Direct Costs</b>			<b>* Funds Requested (\$)</b>	
* Direct Cost less Consortium F&A			<input type="text" value="50,000.00"/>	
Consortium F&A			<input type="text"/>	
<b>* Total Direct Costs</b>			<input type="text" value="50,000.00"/>	
<b>B. Indirect Costs</b>				
	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1.	Modified Total Direct Costs	<input type="text" value="57"/>	<input type="text" value="50,000.00"/>	<input type="text" value="28,500.00"/>
2.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cognizant Agency (Agency Name, POC Name and Phone Number)		<input type="text"/>		
Indirect Cost Rate Agreement Date <input type="text" value="03/02/2011"/>		Total Indirect Costs		<input type="text" value="28,500.00"/>
<b>C. Total Direct and Indirect Costs (A + B)</b>			<b>Funds Requested (\$)</b>	<input type="text" value="78,500.00"/>
<b>Budget Period: 2</b>				
Start Date: <input type="text" value="04/01/2013"/>		End Date: <input type="text" value="09/30/2013"/>		
<b>A. Direct Costs</b>			<b>* Funds Requested (\$)</b>	
* Direct Cost less Consortium F&A			<input type="text" value="25,000.00"/>	
Consortium F&A			<input type="text"/>	
<b>* Total Direct Costs</b>			<input type="text" value="25,000.00"/>	
<b>B. Indirect Costs</b>				
	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1.	Modified Total Direct Costs	<input type="text" value="57"/>	<input type="text" value="25,000.00"/>	<input type="text" value="14,250.00"/>
2.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cognizant Agency (Agency Name, POC Name and Phone Number)		<input type="text"/>		
Indirect Cost Rate Agreement Date <input type="text" value="03/02/2011"/>		Total Indirect Costs		<input type="text" value="14,250.00"/>
<b>C. Total Direct and Indirect Costs (A + B)</b>			<b>Funds Requested (\$)</b>	<input type="text" value="39,250.00"/>

## PHS 398 Modular Budget, Periods 3 and 4

<b>Budget Period: 3</b>				
Start Date: <input style="width: 100px;" type="text"/>		End Date: <input style="width: 100px;" type="text"/>		
<b>A. Direct Costs</b>				* Funds Requested (\$)
* Direct Cost less Consortium F&A				<input style="width: 100px;" type="text"/>
Consortium F&A				<input style="width: 100px;" type="text"/>
* Total Direct Costs				<input style="width: 100px;" type="text"/>
<b>B. Indirect Costs</b>				
	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
2.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
3.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
4.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
Cognizant Agency (Agency Name, POC Name and Phone Number)		<input style="width: 95%;" type="text"/>		
Indirect Cost Rate Agreement Date <input style="width: 100px;" type="text"/>		Total Indirect Costs <input style="width: 100px;" type="text"/>		
<b>C. Total Direct and Indirect Costs (A + B)</b>				Funds Requested (\$) <input style="width: 100px;" type="text"/>

  

<b>Budget Period: 4</b>				
Start Date: <input style="width: 100px;" type="text"/>		End Date: <input style="width: 100px;" type="text"/>		
<b>A. Direct Costs</b>				* Funds Requested (\$)
* Direct Cost less Consortium F&A				<input style="width: 100px;" type="text"/>
Consortium F&A				<input style="width: 100px;" type="text"/>
* Total Direct Costs				<input style="width: 100px;" type="text"/>
<b>B. Indirect Costs</b>				
	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
2.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
3.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
4.	<input style="width: 95%;" type="text"/>	<input style="width: 30px;" type="text"/>	<input style="width: 100px;" type="text"/>	<input style="width: 60px;" type="text"/>
Cognizant Agency (Agency Name, POC Name and Phone Number)		<input style="width: 95%;" type="text"/>		
Indirect Cost Rate Agreement Date <input style="width: 100px;" type="text"/>		Total Indirect Costs <input style="width: 100px;" type="text"/>		
<b>C. Total Direct and Indirect Costs (A + B)</b>				Funds Requested (\$) <input style="width: 100px;" type="text"/>

## PHS 398 Modular Budget, Periods 5 and Cumulative

**Budget Period: 5**

Start Date:  End Date:

**A. Direct Costs**

	* Funds Requested (\$)
* Direct Cost less Consortium F&A	<input type="text"/>
Consortium F&A	<input type="text"/>
* Total Direct Costs	<input type="text"/>

**B. Indirect Costs**

	Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	* Funds Requested (\$)
1.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4.	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Cognizant Agency (Agency Name, POC Name and Phone Number)

Indirect Cost Rate Agreement Date  Total Indirect Costs

**C. Total Direct and Indirect Costs (A + B)** Funds Requested (\$)

**Cumulative Budget Information**

**1. Total Costs, Entire Project Period**

*Section A, Total Direct Cost less Consortium F&A for Entire Project Period	\$	<input type="text" value="75,000.00"/>
Section A, Total Consortium F&A for Entire Project Period	\$	<input type="text"/>
*Section A, Total Direct Costs for Entire Project Period	\$	<input type="text" value="75,000.00"/>
*Section B, Total Indirect Costs for Entire Project Period	\$	<input type="text" value="42,750.00"/>
*Section C, Total Direct and Indirect Costs (A+B) for Entire Project Period	\$	<input type="text" value="117,750.00"/>

**2. Budget Justifications**

Personnel Justification	<input type="text" value="1240-Mehlman-R05_NIH-ELSI-Milli"/>	<a href="#">Delete Attachment</a>	<a href="#">View Attachment</a>
Consortium Justification	<input type="text"/>	<a href="#">Add Attachment</a>	
Additional Narrative Justification	<input type="text"/>	<a href="#">Add Attachment</a>	



ELSI in Military Genomics – Mehlman, M.J.

**Personnel Justification**

Maxwell Mehlman, [EFFORT] Year 1, [EFFORT] Year 2, [EFFORT] Mehlman is the PI. He will supervise all research assistants, will conduct the analyses, and will author papers and conference abstracts for dissemination.

## PHS 398 Research Plan

### 1. Application Type:

From SF 424 (R&R) Cover Page. The response provided on that page, regarding the type of application being submitted, is repeated for your reference, as you attach the appropriate sections of the Research Plan.

\*Type of Application:

New    Resubmission    Renewal    Continuation    Revision

### 2. Research Plan Attachments:

Please attach applicable sections of the research plan, below.

1. Introduction to Application (for RESUBMISSION or REVISION only)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2. Specific Aims	1241-Mehlman-R03_NIH-ELSI-M	<input type="text"/>	<a href="#">Delete Attachment</a>	<a href="#">View Attachment</a>
3. *Research Strategy	1242-Mehlman-R03_NIH-ELSI-M	<input type="text"/>	<a href="#">Delete Attachment</a>	<a href="#">View Attachment</a>
4. Inclusion Enrollment Report	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
5. Progress Report Publication List	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>

#### Human Subjects Sections

6. Protection of Human Subjects	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
7. Inclusion of Women and Minorities	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
8. Targeted/Planned Enrollment Table	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
9. Inclusion of Children	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>

#### Other Research Plan Sections

10. Vertebrate Animals	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
11. Select Agent Research	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
12. Multiple PD/PI Leadership Plan	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
13. Consortium/Contractual Arrangements	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>
14. Letters of Support	1243-Mehlman-R03_NIH-ELSI-M	<input type="text"/>	<a href="#">Delete Attachment</a>	<a href="#">View Attachment</a>
15. Resource Sharing Plan(s)	<input type="text"/>	<a href="#">Add Attachment</a>	<input type="text"/>	<input type="text"/>

16. Appendix   [Add Attachments](#)

## ELSI in Military Genomics Mehlman, M.J.

### Specific Aims

Advances in genomic science are attracting the interest of the U.S. military for their potential to improve medical care for members of the military and to aid in military recruitment, training and specialization, and mission accomplishment. In addition, large DNA banks operated by the military could be a valuable resource for military and civilian researchers. While ELSI research projects have explored issues raised by the use of genomic science in a wide variety of contexts, there has been virtually no examination of the ethical, legal, and social issues raised by military genomics beyond those relating to forensic use of the Department of Defense (DoD) DNA Registry.

This project will bring the insights from the ELSI program and the broader conversation on the ethical, legal, and social issues posed by genomic science in general to bear on the unique challenges presented by potential uses of genomic science by the military. Building on work now underway to develop a bioethical framework for military bioenhancement, this project will construct the first bioethical and legal framework for military genomics, and will employ this framework to analyze how ELSI issues might be resolved.

Specifically, the project will:

1. Identify potential non-forensic uses of genomics by the military. The analysis will expand on recommendations set forth in DoD and NRC reports, including a December 2010 report commissioned by the DoD from the JASONs. A series of representative cases will be generated to facilitate subsequent analysis.
2. Identify ethical, legal, and social issues raised by these potential uses. The investigator will identify ELSI issues that have been raised by comparable uses of genomics outside of the military and identify the special concerns that would be raised by their use in various military contexts.
3. Develop an ethical and legal framework for non-forensic military genomics. Although work has been done on the ethics of using military personnel as human subjects and on the rights of combat troops to receive medical treatment in wartime, there is no general model of biomedical ethics for the military. As part of a project funded by the Greenwall Foundation, the principal investigator currently is developing an ethical framework to help guide the use of biomedical enhancement by the military, and as part of this R03, he will adapt this framework to serve as the foundation for generating a set of principles to guide non-forensic uses of genomics by the military.
4. Apply the bioethical and legal framework to military genomics. The project will combine the framework developed in Specific Aim #3 with the ELSI insights generated in Specific Aim #2 to produce an ethical, legal, and social analysis of potential non-forensic uses of genomics by the military identified in Specific Aim #1.
5. Disseminate the results of the project to military decision-makers, genomic scientists, and other relevant constituencies.

## ELSI in Military Genomics – Mehlman, M.J.

**Research Strategy****Significance**

Although interest in genomic science has been increasing for a wide variety of uses, from medical research and treatment to reproductive decision-making to enhancing performance, the U.S. military until recently does not appear to have focused significant attention on the potential military uses of genomics beyond conducting research on defenses against bioengineered weaponry (DoD Joint Service Budget request 2007) and operating the Armed Forces Repository of Specimen Samples for the Identification of Remains (AFRSSIR), a DNA registry for service members and some civilians to enable remains to be identified.

The military's interest in human genomics is beginning to grow, however. In 2001, the Committee on Opportunities in Biotechnology for Future Army Applications of the Board on Army Science and Technology at the National Research Council issued a report calling for the Army to "lead the way in laying ground-work for the open, disciplined use of genomic data to enhance soldiers' health and improve their performance on the battlefield." (National Research Council 2001). In 2002, a report by the DoD Information Assurance and Analysis Center observed that "because genomics [sic] information offers clues to improving human performance it could provide the Army with means of increasing combat effectiveness" (Melson 2004). In 2009, in collaboration with the National Institute of Mental Health, the U.S. Army began a \$50 million study known as the Army Study to Assess Risk and Resilience in Service members to identify risk factors for military suicides, which includes collecting and analyzing DNA to assess genetic risk factors. (Federal News Service 2009).

Most recently, in December 2010, the JASONS, a group of scientific advisors to the military, issued a report entitled "The \$100 Genome: Implications for the DoD" that outlined an ambitious plan to employ genomic technologies to "enhance medical status and improve treatment outcomes," enhance "health, readiness, and performance of military personnel," and "know the genetic identities of an adversary." (JASON 2010). The report also called for the DoD to take advantage of its "large, well-defined population in generally good health, together with their medical records" to "facilitate valuable longitudinal studies correlating genotype and phenotype." The report went on to recommend that the DoD "determine which phenotypes that might reasonably be expected to have a genetic component have special relevance to military performance and medical cost containment. These phenotypes might pertain to short- and long-term medical readiness, physical and mental performance, and response to drugs, vaccines, and various environmental exposures, all of which will have different features in a military context. More specifically, one might wish to know about phenotypic responses to battlefield stress, including post-traumatic stress disorder, the ability to tolerate conditions of sleep deprivation, dehydration, or prolonged exposure to heat, cold, or high altitude, or the susceptibility to traumatic bone fracture, prolonged bleeding, or slow wound healing."

In short, the U.S. military may be about to (1) create an enormous DNA biobank (more than 1.1 million active military personnel (DoD Personnel Statistics 2010) plus certain civilian defense employees and outside contractors) that can correlate DNA analyses with the information in individual medical and service records; (2) mine these data for genotype/phenotype correlations relevant to military concerns; (3) employ genetic screening and testing for prospective and current military personnel; and (4) use advances in genomic science, including those facilitated by research with the DNA biobank, to improve the health, physical fitness, and performance of military personnel. The military recently took a major step by agreeing to unify the medical records systems in the Defense Department and the Department of Veterans Affairs (Dao 2011).

Military applications of genomics raise serious ethical, legal, and social issues. Indeed, the JASONs “major recommendation” in their 2010 report is that “the DoD should establish policies that result in the collection of genotype and phenotype data, the application of bioinformatics tools to support the health and effectiveness of military personnel, and *the resolution of ethical and social issues that arise from these activities*” (emphasis added). The ELSI program has studied similar issues outside of the military, including consent, privacy and confidentiality, stigma and discrimination, research ethics, the accuracy of genetic testing and the interpretation and communication of test results, and the risks and benefits of using genomic technologies for enhancement purposes. But the military context differs in highly significant ways from civilian settings, which raises unique ethical, legal, and social challenges. Unlike in most medical applications of genetics, for example, the welfare of the individual military patient or person being tested is not paramount, but instead is subordinate to the needs of the unit, the mission, and the state. This requires a reconsideration of the principle of autonomy, the appropriate role for consent, and the scope of privacy and confidentiality. The command structure of the military poses practical obstacles to voluntariness that may undermine even a limited role for informed consent. In terms of research, the functioning of IRBs in reviewing military research remains unexplored, and therefore the degree to which they can protect human subjects is unknown. Unlike civilians, moreover, members of the military are precluded by the so-called Feres doctrine from suing the military for personal injury, including medical malpractice. Finally, the desire to complete missions safely and effectively may lead combat personnel, and especially special forces troops, to accept large risks from genetic enhancement technologies, which may require a rebalancing of the relationship between individual choice and paternalism.

There is a literature on ethical, legal, and social issues raised by the military’s forensic DNA registry (Hendricks 2004; Ham 2003; Reiter 1999; Erbes 1999; Scherer 1997; Gill 1997), but little attention that has been paid to the issues presented by potential non-forensic uses of genomics by the military, including those described above. One exception is the enactment in 2008 of the National Defense Authorization Act, which reversed a previous policy that held that members of the armed services could not claim a military disability for hereditary conditions. (Baruch and Hudson 2008).

This project will be the first attempt to comprehensively identify and analyze the issues raised by military uses of genomics for non-forensic purposes. It will combine the rich knowledge-base produced by the ELSI program together with emerging insights into military bioethics to explore how these challenges might be resolved, with the goal of initiating the critical conversations that must take place among geneticists, bioethicists, legal experts, military planners, veterans groups, and policy-makers so that the military can obtain benefits from genomic science in an ethically, legally, and socially appropriate manner.

The principal investigator is particularly qualified to conduct this project. He has researched and written on ELSI issues since 1992, has been the principal investigator on two ELSI R01 projects and a co-investigator on four others, was a co-investigator and member of the executive board of the P50-funded Center for Genetics Research Ethics and Law, and has been a member of the ELSI Study Section (now the Societal and Ethical Issues in Research Study Section) since 2008. He also is the co-author (with Andrews and Rothstein) of the first casebook on genetics, ethics, and the law, now in its third edition, and the co-editor (with Tom Murray) of the *Encyclopedia of Ethical, Legal, and Policy Issues in Biotechnology*. In addition, the PI is gaining increasingly expertise in military bioethics. He is a co-investigator on a project funded by the Greenwall Foundation on bioenhancing warfighters, for which he is developing the first framework for resolving ethical, legal, and social issues involving military uses of biomedical enhancement. In 2009-2010, he was a fellow at the Stockdale Center for Ethical Leadership at the U.S. Naval Academy, working on ethical and legal issues raised by bioenhancement and other emerging military technologies. He is a member of the Consortium for Emerging Technologies, Military Operations, and National Security (CETMONS), where he is the leader of the Bioenhanced Warfighter Thrust Group. He speaks frequently on

military bioethics, including at the 2010 McCain Conference at the U.S. Naval Academy and the 2011 meeting of the International Society of Military Ethics.

The principal investigator will be assisted by graduate research assistants and by a Project Advisory Committee of experts in genomics, ethical and legal issues in genomics, military ethics and law, and military operations:

- Shannon French, Ph.D., Inamori Professor of Ethics, Director of the Inamori International Center for Ethics and Excellence, formerly Associate Professor of Philosophy in the Ethics Section of the Department of Leadership, Ethics, and Law at the U.S. Naval Academy.
- Jason Gatliff, Ph.D., Integrated Ethics Program Officer at the Cleveland Louis Stokes VA Medical Center and Director of Ethics Consultation at Case Western Reserve University's Center for Biomedical Ethics at MetroHealth Medical Center, formerly the William Lyon's Chair in Professional Ethics at the U.S. Air Force Academy with over eighteen years in active and reserve components of the military,
- Eric Juengst, Ph.D, Director of the UNC Center for Biomedical Ethics, formerly Director of the Center for Genetic Research Ethics and Law at Case Western Reserve University and the first Chief of the Ethical, Legal and Social Implications Branch of the National Center for Human Genome Research at the National Institutes of Health.
- Robert Latiffe, Ph.D., (Maj. Gen., USAF ret.), Research Professor and Director of the Intelligence and Security Research Center, George Mason University.
- George Lucas, Ph.D, Professor of Philosophy and Director of Navy and National Programs in the Vice Admiral James B. Stockdale Center for Ethical Leadership at the U.S. Naval Academy.
- Gary Marchant, Ph.D, J.D., Lincoln Professor Emerging Technologies, Law and Ethics at the Sandra Day O'Connor College of Law at Arizona State University, Professor of Life Sciences at ASU and Executive Director of the ASU Center for the Study of Law, Science and Technology.
- Thomas Murray, Ph.D., President, The Hastings Center.
- Georgia Wiesner, MD, Georgia L. Wiesner, Associate Professor of Genetics and Medicine at Case Western Reserve University and director of the Center for Human Genetics at University Hospitals of Cleveland.

### **Innovation**

The project will produce a new research and practice paradigm by being the first to propose a theoretical framework for resolving ethical, legal, and social uses of genomics by the military. It also will be the first attempt to examine the ethical, legal, and social issues raised by non-forensic uses of genomics by the military, which it will accomplish through a novel amalgamation of information from three different research thrusts: ethical, legal, and social insights from the ELSI program and the associated literature; a new framework for ethical, legal, and social issues involving military uses of biomedical enhancement constructed by the principal investigator; and an understanding of potential real-world military applications of genomics, gleaned with the help of input from an advisory committee comprised of experts in genomics, bioethics, law, military ethics, military law, and military operations.

### **Study design**

This project will employ the methodology of ethical (Beauchamp and Childress 2001; Jecker, Jonsen and Pearlman 1997), legal (Huhn 2003; Posner 1990), and policy (Nagel 1984) analysis. It will include literature reviews conducted by graduate student research assistants from the CWRU Schools of Law and Medicine, under the supervision of the principal investigator. Preliminary findings from each task will be reviewed by the Project Advisory Committee.

The project will be divided into five tasks:

Task 1: Identify potential non-forensic uses of genomics by the military. This portion of the project will rely on and expand the recommendations in the JASON report and other publicly-available DoD sources. It will categorize the potential uses of military genomics first into broad technology groupings (e.g., DNA sampling; biobanking and biobank research; genetic screening and testing; human subjects research for health- and non-health related purposes; enhancement using rDNA products; gene insertion and deletion for medical and non-medical purposes). Each group of technologies then will be grouped by potential uses (e.g., recruitment, training, classification and specialization; promotion; research, deployment for health promotion or performance enhancement). The project then will identify relevant variables that may affect the ethical, legal, and social analysis. These variables include the characteristics of the military personnel who would be affected (e.g., combat troops, special forces, service troops; rank; career; reservist; National Guard; length of service commitment; demographics); the nature of the mission (e.g., combat, support); and risks, costs, and benefits (including those affecting third parties such as family members and other civilians). The results of these analyses will be used to construct a series of representative cases reflecting different mixes of variables (e.g., obtaining DNA from individuals seeking to enlist and testing it for performance-related information).

Task 2: Identify ethical, legal, and social issues raised by these potential uses. The next stage of the analysis will be a targeted review of the ELSI and other relevant literature discussing the ethical, legal, and social issues raised by uses of genomics outside of the military that resemble the military uses identified in Task 1, for example, issues raised by biobanking generally, and the recommendations for resolving those issues. The project then will analyze how the resolution of these issues might be affected by the military context. For instance, limitations on the autonomy of military personnel would affect the degree to which informed consent could be expected to protect them from unethical genomic research.

Task 3: Develop an ethical framework for non-forensic military genomics. The next step in the analysis will be to take the ethical framework for military enhancement being developed in the Greenwall project to guide biomedical enhancement by the military and adapt it to serve as a set of principles to guide non-forensic uses of genomics by the military. The enhancement framework is being derived by synthesizing medical, medical research, military, and public health ethical and legal models and by modifying classic principles of law and bioethics (autonomy, beneficence, justice, political and civil rights, fiduciary duties, etc.) to accommodate military exigencies in an ethically and legally appropriate manner. This project will adapt this framework so that it can form the normative basis for responding to specific issues raised by non-forensic military uses of genomics. For example, the use of biomedical enhancement in the military would likely be accompanied by a variety of biomedical tests and other phenotypic and behavioral observations about the warfighters who would be given the enhancements or who would serve as subjects in military enhancement research. Warfighters who scored lower but still within the normal range on the Armed Services Vocational Aptitude Battery test, for instance, might be deemed a priority group to receive cognition-enhancing drugs. In May 2010, Maryland passed a law barring public high schools from automatically relaying high school students' ASVAB scores to the DoD without the consent of the students and, if the students are under 18, their parents. (USA Today 2010). From an ethical and legal standpoint, the interests of individuals (and their parents) in controlling access to the ASVAB results must be weighed against the needs of military recruitment, and the Greenwall framework will propose a set of ethical and legal guidelines for determining if the Maryland law struck the right balance. But what if pre-enlistment aptitude testing included genetic testing? An argument can be made that the military's access to data from genetic tests should be more limited than its access to information from other types of performance testing. On the other hand, it can be argued that treating genetic test results differently would be to fall into the trap of genetic exceptionalism. Similarly, while military personnel comprise a vulnerable population in biomedical research with human subjects generally (Mehlman et al. 2010; Mehlman et al. 2009; Mehlman and Berg 2008), the need for research protections may be greater if researchers obtain access to identifiable genomic information about individual subjects.

Based on these types of insights, the project will construct an ethical and legal framework for military genomics. This framework will address such issues as (1) when would the use of genomics fulfill a legitimate military purpose; (2) how should the risks and benefits of the military use of genomics be measured and compared; (3) when would the benefits outweigh the risks, and what steps must the military take to minimize the risks; (4) when would military use of genomics be necessary, in the sense that there were no alternatives that offered a more favorable ratio of risks to benefits; (5) what is the role of consent in military genomics; (6) how transparent should military uses of genomics be; (7) how can the benefits and burdens be fairly distributed; (8) what should the standard be for holding superiors accountable for harm that should have been prevented. In addition, this framework will consider who should make these various judgments.

Task 4: Use this framework to suggest how to resolve ethical, legal, and social issues raised by the non-forensic use of genomics by the military. The final stage of the analysis will apply the ethical framework developed in Task 3 and the issues identified in Task 2 to the cases identified in Task 1. The result will be a series of suggestions for how to resolve the issues raised by those specific types of cases. For example, one case from Task 1 will involve pre-enlistment genetic testing, both for medically-related conditions or susceptibilities and for non-medical traits. One of the issues identified in Task 2 will be disclosure of the test results, including whether the results should be disclosed at all, and if so, which results, how, when, and to whom. Task 2 also will identify ways in which the resolution of these issues might differ in military- and non-military contexts. For example, an individual who is disqualified from military enlistment due to the results of the testing or who intends to enlist later is in a different position ethically, legally, and practically from a civilian getting tested by a physician for medical purposes. The ethical framework developed in Task 3 then will be used to provide guidance on how to answer the earlier questions, for example, among other things, how to weigh the potentially competing interests of the individual, the military, the state, and third parties such as family members, and how genetic nondiscrimination and professional liability laws might apply. The aim is not to present a definitive set of recommendations, but instead to propose and evaluate the pros and cons of different resolutions and arguments. For example, the military arguably is entitled to use the results of genetic testing to determine if an individual is fit for service, but may have a legitimate concern in preventing disclosure of certain test results that could identify certain genetic variations that the military was seeking or avoiding in its members, which adversaries potentially could exploit to find vulnerabilities in our troops. (The JASON report, for instance, cited the need “to prevent an adversary from accessing the genetic identities of U.S. military personnel.”) An appropriate ethical framework presumably would recognize that the principle that a competent adult has the right to obtain the results of his or her genetic testing may need to be constrained in this case, but the project would consider whether the individual’s welfare nevertheless should override the military’s interests in some situations, such as when the test results were vital to protect the health of the individual or family members. In addition to using the framework developed in Task 3 to address the issues raised by those specific cases, the analysis also will demonstrate how the analytic method was employed so that the framework can be used to resolve additional issues that might be identified in the future. Finally, the project will identify areas for further research.

Task 5: Disseminate results to appropriate audiences. The results of the project will be presented in a series of scholarly articles, white papers, briefings, and conference presentations. These results will be of interest to a number of audiences: military and civilian decision-makers; military researchers and military research program officers; military physicians; the NHGRI and other genomics policy-makers; geneticists and genomic researchers; bioethicists; legal scholars; and social scientists. The ultimate deliverable will be a book or book-length report presenting all of the study results. A series of articles tailored to specific audiences will be published in journals such as *Science*, *JAMA*, *the American Journal of Human Genetics*, *Genomics*, *Nature Genetics*, *The Hastings Center Report*, *The Journal of Law, Medicine & Ethics*, *The*



*Military Law Review, Journal of Military Ethics, Armed Forces Journal, Military Medicine, Armed Forces and Society, Naval War College Review Air and Space Power Journal, Joint Force Quarterly, Marine Corps Gazette, Military Review, and Parameters.* The PI will prepare and deliver presentations at academic, professional, and military research conferences, such as the International Society for Military Ethics (ISME) annual meeting on January 27-29, 2012, and at meetings of the American Society for Bioethics and the Humanities, the American Society for Law, Medicine, and Ethics, the American Society of Human Genetics, and the American College of Medical Genetics. In addition, the investigators will prepare and submit briefing papers to the Defense Advanced Research Projects Agency, the Office of Naval Research, and other government agencies involved in military operations and military medicine.

### Problems and Alternatives

The only potential problem would be if the Greenwall Project were not complete enough in time to serve as the starting point for the creating the ethical and legal framework for the military use of genomics in Task 3. The likelihood of this occurring is highly remote, since the Greenwall project is already almost complete and the deadline for completion is September 2011, well before this project would commence.

### Preliminary Studies

The principal investigator is a co-investigator on a project funded by the Greenwall Foundation on enhanced warfighters, for which he is developing the first framework for addressing ethical, legal, and social issues involving military uses of biomedical enhancement. He has completed a 61-page draft of his portion of the project report. The final report is due in September, 2011. Prior to that project, the P.I. was a fellow at the Stockdale Center for Ethical Leadership at the U.S. Naval Academy, working on ethical and legal issues raised by bioenhancement and other emerging military technologies. He is a member of the Consortium for Emerging Technologies, Military Operations, and National Security (CETMONS), and leader of the CETMONS Bioenhanced Warfighter Thrust Group. He is a frequent speaker on military bioethics, including at the 2010 McCain Conference at the U.S. Naval Academy, the 2011 meeting of the International Society of Military Ethics, and the 2011 Brocher Foundation Summer Academy on Human Enhancement Conference in Geneva.

### Timeline and Benchmarks

Funding is requested for 18 months.

		Months								
		1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17-18
Task 1		→								
Task 2			→							
Task 3				→						
Task 4						→				
Task 5								→		
Bench- marks		Categor- izations and variables	Repre- sentative cases	Geno- mics lit. review; ELSI issues	Analysis within military context	Ethical frame- work	Framework applied to cases		White papers, briefings, final report, conference presentations	

ELSI in Military Genomics – Mehlman, M.J.

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The following letter of support was included as part of the original application and is provided with the permission of Dr. Marchant. An additional 7 letters were included in the original application but have been redacted to protect the privacy of individuals providing letters of support.



Direct Dial: (480) 965-3246

May 24, 2011

Maxwell J. Mehlman  
Arthur E. Petersilge Professor of Law,  
Director, The Law-Medicine Center  
Case Western Reserve University School of Law,  
Professor of Bioethics,  
Case Western Reserve University School of Medicine  
11075 East Boulevard  
Cleveland, Ohio 44106

Dear Max:

I am pleased to accept your invitation to serve as a member of the Project Advisory Committee for your R03 ELSI project on military genomics. Your proposed project examining the important set of issues raised by the military's interest in using genomic information for a variety of military and non-military applications is timely, original and much-needed. Your extensive expertise and work in the subject of the ethical and legal implications of human enhancement, combined with your project funded by the Greenwall Foundation on military enhancement, makes you uniquely qualified to address this subject.

I look forward to contributing to your project by lending my expertise in the legal and ethical applications of genomic information, as well as my recent collaborations with you and other experts on ethical and legal aspects of military technologies. I understand that I will be asked to read and comment on drafts of papers that you produce in the course of the project, as well as to serve as a resource to respond to issues that may come up within my areas of expertise. I am confident that my experience will enable me to make a significant positive contribution to the project.

Sincerely,

A handwritten signature in black ink, appearing to read "Gary E. Marchant".

Gary E. Marchant, Ph.D., J.D., M.P.P.  
Lincoln Professor of Emerging Technologies, Law & Ethics,  
Executive Director, Center for Law, Science & Innovation

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# PHS 398 Checklist

OMB Number: 0925-0001

## 1. Application Type:

From SF 424 (R&R) Cover Page. The responses provided on the R&R cover page are repeated here for your reference, as you answer the questions that are specific to the PHS398.

\* Type of Application:

New    Resubmission    Renewal    Continuation    Revision

Federal Identifier:

## 2. Change of Investigator / Change of Institution Questions

Change of principal investigator / program director

Name of former principal investigator / program director:

Prefix:

\* First Name:

Middle Name:

\* Last Name:

Suffix:

Change of Grantee Institution

\* Name of former institution:

## 3. Inventions and Patents (For renewal applications only)

\* Inventions and Patents:   Yes    No

If the answer is "Yes" then please answer the following:

\* Previously Reported:   Yes    No

**4. \* Program Income**

Is program income anticipated during the periods for which the grant support is requested?

Yes       No

If you checked "yes" above (indicating that program income is anticipated), then use the format below to reflect the amount and source(s). Otherwise, leave this section blank.

*Budget Period	*Anticipated Amount (\$)	*Source(s)
<input type="text"/>	<input type="text"/>	<input type="text"/>
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**5. \* Disclosure Permission Statement**

If this application does not result in an award, is the Government permitted to disclose the title of your proposed project, and the name, address, telephone number and e-mail address of the official signing for the applicant organization, to organizations that may be interested in contacting you for further information (e.g., possible collaborations, investment)?

Yes       No