Reflections on Current Research: Science and Scientists in Military Organizations

Kerry Fosher

All views expressed in this piece are those of the author alone and do not represent the position of the United States Marine Corps.

Reflections on Current Research: Science and Scientists in Military Organizations[1]

"Military audiences have no patience with hearing about the limitations of a research project. They want everything to be definitive. If you don't present your findings that way, they tune out. You just have to hope that, somewhere down the line, they'll figure it out before they implement something."

-Scientist working within a DoD organization 2013

"My responsibility as an applied scientist is to communicate results, not to help them [military personnel] figure out what to do with them. It sounds callous, but it's not my fault if they rely on only one study or use the results in a way I didn't intend."

-Scientist at an external organization with a project funded by DoD 2013

"We have to trust that the scientists are telling the truth. We don't have time to do the all the background to figure it out. We just have to trust."

-DoD senior executive civilian (retired officer) 2013

"No matter what one scientist says, another comes along and says something else is true. Either you trust one of them more than the other or you just go with your gut."

-DoD military officer 2013

[2]

[1] All views expressed in this piece are those of the author alone and do not represent the position of the United States Marine Corps.
[2] All quotations were gathered uner the research protocol, "Science Consumption in Military Organizations," which was reviewed and approved by the Marine Corps Human Subjects Protection Office 17 October 2013.

From my initial anthropological fieldwork on U.S. homeland security through my time working within different Department of Defense (DoD) organizations, I have watched the way military and civilian organizations involved in national security interact with science and scientists. Like other scholars and practitioners, I saw many problems with organizations' ability to select appropriate scientific expertise and research designs, critically assess claims, and make use of results. Initially, I was concerned with the bias toward "hard science" approaches and quantitative results that, while familiar to the people in national security organizations, were inappropriate to the problems at hand. I focused on communicating the value of qualitative social and behavioral research and trying to shift organizational leaders out of their quantitative comfort zones. Although I had some successes, I knew I needed to look at the broader context and patterns in which these problems were embedded.

Recently, I have been able to start a small research project to examine DoD's relationships with science and scientists in more depth within the context of the U.S. Marine Corps. This note presents informal reflections on the project in its early stages, the practical problems that spurred my interest, the historical context of those problems, and some structural barriers to data gathering. Since the research is ongoing, I do not present findings or propose solutions. However, the work thus far, as well as the obstacles I have encountered, may serve to illustrate the challenges of trying to conduct systematic research on how the military consumes scientific expertise and knowledge.

The project, loosely titled "Science Consumption in Military Organizations," is an effort to combine knowledge gained through practice[1] with more systematic documentary and interview-based research. As such, it is an experiment in methods, as well an examination of the topic of science consumptions. My primary concern is with the social and behavioral sciences, but as will become clear in this note, it is difficult to separate those issues specific to those fields from broader trends affecting many disciplines.[2] I hope to be able to spend some research time investigating three areas:

- structures, processes, and discourses that form the context of how military organizations think about science and scientists and vice versa,
- the educational and experiential backgrounds of military and civilian decision-makers and scientists (whether working within or performing research sponsored by a military organization) that shape interactions and decisions,
- and some of the opportunities and obstacles to improving communication.

As of the time of this note, I am at the very beginning of understanding the shape of the problems and how they arose. What follows therefore is an informal account of some of a few of the patterns I am seeing as I examine the problems, historical context, and individual backgrounds. The material presented is partial and preliminary, but may provide some fodder for

[1] Most anthropological knowledge is developed through research projects, either traditional or applied. Knowledge gained through working within an organization, using anthropology for work other than research or teaching, such as policy development or scientific advising, is less commonly reported.

[2] It is equally challenging to focus exclusively on the ability of military organizations to take advantage of critical perspectives on science without also looking at basic science literacy. Consequently, some material referenced in this note focuses on physical and biological sciences. I do not want use of these materials to be taken as an indication that I am calling for competence in reductive, positivist approaches to science. It is simply an indicator of the complexity of the questions and data sources.

discussion and thought about problems and contexts many readers share.

PATTERNS AS SEEN FROM THE STANDPOINT OF PRACTICE

> "*The administrator uses social science the way a drunk uses a lamppost, for support rather than illumination.*" (Leighton, 1949:128)

The quotations at the start of this note point to a serious disconnect between the way scientists and military and civilian decision-makers perceive their roles and communication opportunities. Of course, the reality is not always this stark. There are plenty of scientists and DoD personnel who work hard to improve communication about science and think through how results should be interpreted, critiqued, and used. However, there are still significant problems with the way DoD understands and uses scientific expertise, conceptualizes problems and research projects, and interprets results.

The problems with DoD's and, more broadly, government's ability to understand and use scientific expertise and knowledge are not unchartered territory. The science policy and science and technology studies literatures contain many case studies and critical perspectives on the topic. There also is a substantial "grey" literature of policy documents, internal studies, roadmaps, and recommendations. I will not review these literatures in this brief note, although a few of the more accessible sources are cited below.

For now, I will focus on the understanding of problems that emerges through practice, working within military organizations and advising decision-makers on supporting research or critically assessing results. Most people who have studied or worked with DoD have had the experience of looking at research projects and thinking, "How on earth did that ever get funded? Who thought that would be a good idea?" DoD is awash in studies that have serious problems and are unlikely to ever yield useful results or critical perspectives. Some of the more common issues include:[3]

- research questions so overly or poorly defined that the design and outcomes are pre-determined (e.g., a research task on how a military organization can adjust to Millennials that presumes both the validity of generational cohort research and its salience to planning future organizational change)
- mismatch between methods and question (e.g., an online survey used as the sole instrument to make claims about the effectiveness of a particular kind of training)
- wrong or inadequate expertise used to design, execute, and/or analyze results (e.g., people with degrees in engineering conducting fieldwork on concepts of ethics among military personnel)
- no articulation of underlying theory (e.g., development of computer-based cultural simulations with minimal or no examination of the assumptions about culture and human behavior underlying the design)
- BOGSAT ("bunch of guys sitting around a table") accepted as scientific research (e.g., a study on organizational change management conducted by consultants with no research experience

[3] Note that the descriptions of problematic studies provided here are general types and do not refer to any specific study funded by or proposed to DoD.

based solely on documents and their own prior experience with the military)

- implying that the study will yield applied results when the science or technology involved is years or decades away from being able to produce results at that level (e.g., the current emphasis on trying to explain everything with neurotechnology)
- studies that try to represent qualitative or small sample results in quantitative form (e.g., an interview-based study with an sample of 12 providing results in the form of percentages)
- misapplication or over-extension of results (e.g., a study of how people prefer to get and share information in the U.S. presumed to be globally applicable)
- poor problem scoping (e.g., a study to identify future educational needs of a service that does not take into account contextual factors such as changes in K-12 education, technology, or the expected missions of the service)
- studies based on buzzwords or popular conception rather than scientific concepts (e.g., studies of resilience that proceed with no operating definition of resilience).

It is easy to dismiss the above issues as the result of broken processes in the way scientific research is sponsored or as evidence of favoritism toward particular scientists or organizations. Such critiques are not wrong. Broken processes and favoritism are factors that have to be considered and are the subject of a critical examination beyond the scope of this research note. However, there is more going on that merits attention.

How did we get here?

"… *if administrators have little more than a vague sense of the contours of a research project, they are likely to have little basis to know which rules and regulations constitute unreasonable burdens on the researchers' activities.*" (President's Foreign Intelligence Advisory Board: Special Investigative Panel, 1999:11)[4]

The relationships among scientists and military decision-makers have not always looked the way they do now. In some respects, relationships during and immediately following World War II were smoother and more productive, often rooted in long-standing friendships and social networks that spanned government, academia, and industry. However, the relationships and research programs also lacked transparency and accountability and were somewhat dependent on broader social trust that scientist would always act in the public interest. In this section, I outline some of the historical changes in government and society that formed the context in which the problems described in the preceding section could arise.

An extensive literature of primary and secondary sources on this history exists in fairly accessible form. Some starting points can be found in the science policy writing of Braun and Kevles and a very useful concise overview is provided in Hoyt's account of vaccine innovation (Braun, 2003; Hoyt, 2011; Kevles, 1990, 2006). As with the policy literatures mentioned earlier, it is beyond the scope of this note to provide a thorough review of the history of science and government. What follows is a rough picture of some trends I

[4] This quotation is from a report on security at the National Labs that drew attention to a growing problem in the management of scientific enterprises more broadly. Over the course of the last half-century, management and oversight of scientific programs gradually became the responsibility of professional managers, security personnel, and military officers rather than scientists. As described in this section, that change has meant that the management and assessment of scientific endeavors sometimes negatively impacts the conduct of research.

am noticing in the literature that speak to how research is sponsored and the way government processes affect the scientific workforce.

Programs: During and for a time after World War II, there were tighter bonds among scientists and science consumers in government, industry, and academia, often developed and maintained on the basis of personal relationship networks. During this time period, scientific endeavors often were designed, managed, and assessed by scientists or by military or industry personnel who understood science. This arrangement had advantages in terms of gaining access to expertise and supporting complex, long-term research agendas. It also allowed scientists to make use of a "revolving door" between sectors, working on applications in some settings and then moving back to academia or basic research labs to refresh their knowledge, skills, and relationships.

However, there were the usual downsides of processes supported by personal relationships in terms of transparency, accountability, and impartiality. The social networks that facilitated both research and good working conditions for scientists also served as "old boys clubs." The networks were perceived, perhaps correctly, as excluding other voices, obscuring the process of gaining government funding, and making it difficult to establish accountability for funding and results. Over time, management of scientific programs in government shifted from scientists (or at least officials with an understanding of the complexities of scientific research) to non-specialists. Sometimes, military personnel were assigned for reasons other than their suitability to lead research organizations. Other times, individuals from the growing field of professional management were assigned and some research programs were moved under procurement departments. This left research programs with managers who knew relatively little about how to foster long-term scientific agendas or create appropriate working conditions for scientists.

Along with shifts in management came shifts in the way programs were assessed and the way projects were proposed, selected and designed. Procurement or acquisition organizations used to buying supplies and equipment measured success by delivery of expected goods and process efficiency. These organizations were not a particularly good home for scientific research with its long timelines, knowledge outcomes rather than products, and orientation to results that included the idea that an experiment that helps scientists find out that an idea does not work may be just as valuable as an experiment that shows that the idea does work. The rise of professional management and oversight also meant that many decisions about science were no longer made by scientists. Scientists might be consulted as reviewers or advisors, but they were less frequently positioned to have the final say.

There were many other contributing factors within the broader U.S. society, as public orientations toward science and trust in scientists gradually became less pervasive. There also were shifts within scientific communities, especially in the social and behavioral sciences with an increasing number of scientists coming to question the ethical and political implications of doing work for the military and other government organizations. See for example accounts of anthropology's relationship with the military and intelligence communities by David Price (Price, 1998, 2011, 2014).[5] While capacity to directly

[5] From the mid-1940s through the early 1970s, the government's orientation toward science was also being influenced. Two documents are often pointed to as critical artifacts in the shaping of post WWII science policy and practice and can serve as examples. Vanaveer Bush's "Science the Endless Frontier," which provides a set of recommendations for federal investment in science and the "Project Hindsight" report, which

conduct or sponsor physical and biomedical research or technology development remained in place, the military's ability to access and use most social and behavioral science was utterly broken by the time of the Vietnam War. This situation is captured in the recently republished book, "The Best-Laid Schemes: A Tale of Social Research and Bureaucracy"(Deitchman, 2014 [1976]).

Ultimately, the acquisition orientation with its associated, metrics-driven oversight and accountability processes created an environment where it was challenging for the military to run internal research programs in many fields or even sponsor long-term research initiatives conducted by universities or industry. Overall, there was a significant chilling effect on government research programs and on scientists' willingness to work with government, particularly the military, which continues to the present day in social science.[6]

PEOPLE: At the same time as changing government processes were reshaping how research was understood and conducted, other government offices were trying to standardize and make transparent government hiring and workforce practices. This had some probably unintended, but serious consequences for its scientific workforce. I am still tracing the history of these developments, but the outcomes can be seen within the current workforce. Human resource practices that made some degree of sense for administrative, technical, and managerial positions did not work all that well for scientists and other specialists. The case of position descriptions can serve as an illustration.

Position descriptions, performance standards, and hiring practices for scientists play an important role in the way the scientific workforce in DoD is shaped. Position descriptions often are written by people with little or no knowledge of scientific credentials or processes. Also, because it can be difficult and time consuming to tailor a position description for a particular job, many organizations rely on the generic position descriptions for a field. These descriptions are written to allow some flexibility in hiring, another case of good intentions with unintended consequences. For example, I have seen several advertisements for jobs titled "cultural anthropologist" at the highest tier of the General Schedule (GS) civil service that rely on the baseline government qualifications for anthropology in any subfield at any level, which are "courses equivalent to a major, or a combination of courses totaling at least 24 semester hours in an appropriate field of anthropology, or related course work" (Office of Personnel Management, 2009). No explanation is provided regarding what constitutes "appropriate" or "related." Under this system, it would be completely acceptable to hire somebody with eight undergraduate courses in business management, often considered a social science, to be a cultural anthropologist at a civil service level that outranks everything except the senior executive service.

I am not in any way suggesting that only cultural anthropologists are qualified to serve in

---

examined connections between basic research and weapons innovation (Office of the Director of Defense Research and Engineering, 1969; United States Office of Scientific Research and Development & Bush, 1945). Interestingly each of these reports came to be important in certain debates not because of what they actually said, but because of how they were interpreted or, in some cases, cherry picked. Bush's recommendations seem to have been leveraged to explain lack of funding for the social sciences, despite the fact that he explicitly warns against ignoring these fields. Project Hindsight, hobbled by design constraints, was forced to report minimal connection between basic research and innovation. Despite the authors' stern warning in the introduction that they believed the findings to be very limited and potentially misleading, the report seems to have fed a growing desire among officials to focus funding on research projects that could show an immediate application.

[6] This may be changing now as non-DoD sources of funding decline. However, without changes in other aspects of context or process, it seems unlikely that the results will be satisfactory to either the scientists or the funding organization.

government positions as social scientists, program directors, or in the many other roles social scientists fill. In fact, there are position descriptions and qualification standards for "social scientist" that are appropriate for roles where many different disciplinary backgrounds are applicable. I also recognize that position descriptions often have more to do with job duties than with the professional credentials and qualifications the position titles imply to the scientific community. So, some government organizations may select a position description with a title such as "cultural anthropologist" or "psychologist" not because they need somebody with those specific credentials, but because the work they need done is similar to what they envision cultural anthropologists or psychologists do. I simply use this case as an illustration of how human resource processes affect the ability to recruit a cadre of scientific professionals whose qualifications and roles are discernable for professional development and tracking purposes.

At least in the social and behavioral sciences, the poorly defined position descriptions leave it up to the individual scientist to assert and maintain his or her role in the organization, something I have described elsewhere (Fosher & Tortorello, 2013). This creates considerable challenges for some scientists in terms of being supported to maintain their credentials and to perform their work in accordance with scientific and ethical standards. Personally, the only way I felt comfortable working within a military organization was to live my life in such a way that I could leave the job at any moment, an arrangement that can involve significant personal and professional disadvantages (Fosher, 2010). The confusion about position descriptions, credentials, and roles also leaves organizations vulnerable to individuals who take advantage of the situation to get hired despite the fact that they lack the qualifications to do the work the organization really needs.

Other government accountability processes also have had an influence on the conditions in which scientists work. Developments designed to prevent fraud, waste, and abuse have now left us with systems that ensure we buy office supplies from appropriate sources at agreed upon prices and are compensated for official travel, but make it impossible - for all practical purposes - to buy books and journals, freely collaborate with other scientists, or attend conferences to build knowledge and expertise networks. Some interpretations of contracting regulations, focusing on government ownership of all contractor-produced materials, have even called into question the ability of researchers to protect field notes and other data. Likewise, copyright laws designed to keep people from writing novels at while at work contain no exceptions for scholarly publications, meaning scientists working in the federal government must either give up their professional identities or constrain publication to whatever they can accomplish nights, weekends, and while on vacation.

Of course, some organizations help scientists find work-arounds for these problems, but such solutions take time and attention and become an ongoing drain on the time of scientists and those around them. The gradual bureaucratization of the government workplace, while understandable from the standpoint of transparency, has made DoD an increasingly inhospitable place for scientists to work. This has left DoD with fewer individuals who can serve as formal or informal mediators between government and externally conducted research and as advisors to decision-makers.

DoD is aware of at least some of the problems with its scientific workforce and tries to deal with them through the creation of offices, roles, and guidelines. For example, the most recent National Academies report on DoD's science, technology, engineering, and mathematics (STEM) workforce and the current DoD-wide STEM plan both acknowledge the need to build working conditions and career paths that address the needs of scientists (Committee on Science Technology Engineering and Mathematics Workforce Needs for the U.S. Department of Defense and the U.S. Defense Industrial Base (U.S.) & National Research Council (U.S.), 2012; Department of Defense, 2009). Unfortunately, both reports address working conditions and workforce practices in a somewhat cursory way. They call for some of the necessary changes, such as opportunities to "regreen" and maintain credentials, but fail to make even vague recommendations for how to overcome the significant and complex bureaucratic obstacles involved. The bulk of report space is given over to "supply side" issues, calling for investments in K-12 or university education to help produce the workforce and for improved recruiting.[7] The social and behavioral sciences receive similarly cursory attention, so the policies developed for physical sciences and engineering end up applying to all fields.

The experience of eight years of working with DoD and my preliminary research suggests the efforts called for in the policies described above are not having the desired effect. In less structured ways, many military and civilian leaders are working to overcome problems within their organizations or commands, creating opportunities for scientists and research that help mitigate some of the challenges outlined in this section. I have been fortunate to be helped by several such individuals. While their assistance has made my individual experience and those of my research staff much more agreeable and productive, it is a few small drops in a very large ocean.

LEARNING ABOUT WHAT PEOPLE BRING TO THE TABLE

"Effective science based policy requires the development of appropriate human capability to ensure that policy makers understand science and researchers understand policy, including the limitation of both 'worlds'." (Australian Government: Department of Industry, 2012:iv)

One assumption in my project is that people's prior exposure to scientific concepts and knowledge is likely to be a factor in how they think about problems and expertise, as well as how they interpret research results. I anticipated that some of this exposure would come through work experience and some from education. I knew that it would be difficult to gather systematic information on people's experiences with science. However, even gathering data on the educational backgrounds of the people involved in science-related work in DoD has proven one of the more difficult lines of investigation. There are many different stakeholder groups including, but not limited to:

- military personnel,
- the federal civilian workforce
- the contractor workforce,

[7] Interestingly, no report I have seen mentions the idea that schools and universities may not be comfortable with the idea of DoD "investments," which could reshape what science is and is not taught. It is possible that the report authors are unaware of such concerns. Alternatively, lack of attention to them may reflect tacit understanding that schools and universities are so desperate for funding that they are not well positioned to object regardless of impact. An accessible, but sobering account of the way DoD funding has reshaped university teaching and research agendas can be found in the book, "How the Hippies Saved Physics"(Kaiser, 2011).

- scientists working within military organizations,
- scientists and others working as research program managers, and
- scientists, other researchers, managers, and salespeople in academia and industry who are involved in proposing and carrying out government sponsored research.

I decided to start with the backgrounds of military personnel and scientists employed within the federal civil service system in the Marine Corps. Both turned out to be more challenging than I had anticipated.

I requested the educational backgrounds of Marines for 2000, 2005, 2010, and 2013 through the Marine Corps personnel system. The research support personnel were very responsive and helpful, but the information provided raised as many questions as it answered. The report provided was unclear about whether the system recorded all the degrees a Marine may have received. Based on the answer I received through the personnel system and discussions with Marines, it seems the system only records the most recent degree received. So an individual might have a bachelor's degree in molecular biology, one master's degree in business administration, and another more recent master's in security studies, but only the degree in security studies will show in the system. It also was unclear what percentage of the force was reporting into the system and the latitude they had in describing and categorizing their degrees. This obviously makes it difficult to assess the level of exposure Marines may have had to scientific concepts and methods through their education.

Education from non-DoD institutions is only one part of the education puzzle, as both military and civilian personnel also have access to professional development provided by government institutions. I am still examining professional education and training required or available to Marines once they enter service. However, based on what I have seen thus far, it appears that there is little or no dedicated attention to selecting, critiquing, and using scientific expertise or results. (This is not to suggest deliberate neglect of science. There are many demands, both practical and policy-directed, on curricula for professional military education and training and relatively little time. Many valuable knowledge areas cannot be covered.) Also, although some training on science-related program and budgetary processes is available, there also seems to be little or no training on reviewing scientific proposals and results for military personnel or non-scientist civilians who are assigned to science-related decision-making roles.

Gaining background information on the scientific workforce proved still more difficult, even when restricted to the social and behavioral sciences. While there is a system into which civilians can report education and training, it is designed more for the accumulation of training and certifications in administrative skills than for documenting the professional development of scientists or other specialists. You cannot, for example, report scholarly awards, conferences and workshops, or research projects conducted. My discussions with other scientists suggest that few know the system exists.

Even trying to understand the roles scientists are filling and the number of scientists working for the Marine Corps has not been feasible. While I could request that the personnel system provide me with the number of individuals in billets categorized as scientific, I know from experience with recruiting and hiring personnel that this will paint in inaccurate picture. Many people with social and behavioral science degrees whose work involves science hold positions categorized as analytic, managerial, or administrative. Likewise, many people who are in positions designated as scientific do little or no scientific work. They are program managers, social workers, supervisors, or analysts. Also, as described in the preceding section, there are people in scientific billets with scientific responsibilities who lack the qualifications to do the work and carve out other roles for themselves.

Given the difficulties in data gathering, it is tempting to simply discard the question of what knowledge and experience people bring to the table, but there are compelling reasons to try to find other ways to gain insights into this part of the context. According to the most recent National Science Board report on science and technology indicators, the public's understanding of science has not changed a great deal in the last decade. Most recently, survey respondents were able to provide correct answers to 5.8 of 9 questions on basic scientific knowledge (National Science Board, 2014:7-4). However, this does not mean that there is broad public understanding of basic scientific concepts and processes or even of what we would think of as grade school or high school level knowledge. For example, in the most recent survey, only 55% of respondents were able to correctly identify that it takes the earth one year to go around the sun and only 51% were able to recognize as false a statement that antibiotics kill viruses as well as bacteria (National Science Board, 2014: Appendix Table 7-9). Hardly cause for celebration. The report also contains some troubling interpretations of trends, such as the discussion of results from the question about astrology, "In 2012, slightly more than half of Americans said that astrology was "not at all scientific," whereas nearly two-thirds gave this response in 2010. The comparable percentage has not been this low since 1983" (National Science Board, 2014:7-4).

Is this level of knowledge representative of any or all the groups of interest in this research project? It is hard to know without doing a large-scale survey to assess scientific knowledge in the groups listed above, which is beyond the scope of this project. If the people involved in science decision-making in DoD follow the patterns in the general population, it would be very worrisome. DoD spends millions of dollars on research every year and some of that research influences leader thinking about what the military can accomplish, how it will conduct operations, and how it will take care of service men and women and their families. I will continue to explore different ways to learn about the levels of scientific knowledge of those involved in science-related decision-making, but it may prove impossible to gather truly compelling data.

CONCLUSION

The preceding may seem like an exercise in examining a painful bureaucracy with which many readers are all too familiar – admiring the problem. However, I believe it is necessary for three related reasons. First, the ways science works in DoD, the roles scientists play, and the structural impediments to change are not well understood outside of government. Researchers who hope to do work with DoD or simply to collaborate with DoD scientists are often puzzled or frustrated in their attempts. Scholars who critique DoD's relationship with scientists often conduct their analyses with only a partial understanding of their subject. One of the goals of this project is to find ways to constructively (and hopefully more succinctly) communicate about science in DoD to external audiences.

Second, the elements of bureaucracy described above, as well as other institutional processes and structures, form the context in which many of us work. This is also the context in which people produce much of the scientific knowledge on which DoD relies. Given the amount of trust placed in scientific advice and research results, it is important for anyone conducting or using research to be aware of the constraints and challenges in producing scientific knowledge for DoD. Third, if we are to improve DoD's ability to understand, critique, and use science, we need to understand the full scope of the structures, processes, and discourses that affect it. Applied cultural anthropology emphasizes designing solutions that are sustainable in the local context. While the federal bureaucracy may not be as fascinating a context as how local cultural patterns interact with a public health measure to reduce malaria, studying it is still necessary.

I am conducting this research project within the bureaucratic muddle described above. Consequently, it is difficult to chart the precise course the project will take. I anticipate that the next stages in this research project will follow a similar course, systematizing and checking my practice-based knowledge of processes and discourses and continuing to look for ways to understand people's knowledge base. Early in 2015, I also hope to start conducting interviews on the way scientists think about communicating with military audiences. Regardless of where the project takes me next, I hope this informal note will create opportunities for discussion with both scientists and practitioners with vantage points different from my own.

REFERENCES

Australian Government: Department of Industry, Innovation, Science, Research and Tertiary Education,. (2012). APS200 Project: The Place of Science in Policy Development in the Public Service.

Braun, Dietmar. (2003). Lasting Tensions in Research Policy-Making - a Delegation Problem. *Science and Public Policy, 30*(5), 309-321.

Committee on Science Technology Engineering and Mathematics Workforce Needs for the U.S. Department of Defense and the U.S. Defense Industrial Base (U.S.), & National Research Council (U.S.). (2012). *Assuring the U.S. Department of Defense a strong science, technology, engineering, and mathematics (STEM) workforce*. Washington, D.C.: National Academies Press.

Deitchman, Seymour J. (2014 [1976]). *The Best-Laid Schemes : A Tale of Social Research and Bureaucracy. (2nd Edition)*. Quantico, VA: Marine Corps University Press.

Department of Defense. (2009). DoD STEM Education and Outreach Strategic Plan: 2010-2014. Washington, D.C. .

Fosher, Kerry B. (2010). Yes, Both, Absolutely: A Personal and Professional Commentary on Anthropological Engagement with Military and Intelligence Organizations. In J. D. Kelly, B. Jauregui, S. T. Mitchell & J. Walton (Eds.), *Anthropology and global counterinsurgency* (pp. 261-271). Chicago: The University of Chicago Press.

Fosher, Kerry B., & Tortorello, Frank Jr. (2013). Military and Security. In R. W. Nolan (Ed.), *A Handbook of Practicing Anthropology* (pp. 237-246). New York: Wiley-Blackwell.

Hoyt, Kendall. (2011). *Long shot : vaccines for national defense*. Cambridge, Mass.: Harvard University Press.

Kaiser, David. (2011). *How the hippies saved physics : science, counterculture, and the quantum revival* (1st ed.). New York: W.W. Norton.

Kevles, Daniel J. (1990). Principles and Politics in Federal R&D Policy, 1945-1990: An Appreciation of the Bush Report *Science-The Endless Frontier. NSF 90-8. (Reprint)* (pp. ix-xxxiii). Washington, DC: National Science Foundation.

Kevles, Daniel J. (2006). What's New about the Politics of Science? *Social Research, 73*(3), 761-778.

Leighton, Alexander. (1949). *Human Relations in a Changing World: Observations on the Uses of the Social Sciences*. New York: E.P. Dutton and Company, Inc.

National Science Board. (2014). Science and Engineering Indicators 2014. Arlington, VA: National Science Foundation.

Office of Personnel Management. (2009). General Anthropology Series, 0190. *Classification & qualifications: General schedule qualification standards (Online detail from OPM site. As of access date, the linked Handbook of Occupational Groups and Families is the May 2009 edition)*. Retrieved 6 Apr 2014, 2014, from https://www.opm.gov/policy-data-oversight/classification-qualifications/general-schedule-qualification-standards/0100/general-anthropology-series-0190/

Office of the Director of Defense Research and Engineering. (1969). Project Hindsight Final Report. Washington, D.C.

President's Foreign Intelligence Advisory Board: Special Investigative Panel. (1999). Science at Its Best, Science at Its Worst: A Report on Security Problems at the U.S. Department of Energy.

Price, David H. (1998). Cold War Anthropology: Collaborators and Victims of the National Security State. *Identities: Global Studies in Culture and Power, 4*(3-4), 389-430.

Price, David H. (2011). *Weaponizing anthropology : social science in the service of the militarized state* (1st ed.). Oakland, CA: AK Press.

Price, David H. (2014). Complicating Humanitarian Applied Anthropology in Current, former, and Future Warzones. *Human Organization, 73*(2).

United States Office of Scientific Research and Development, & Bush, Vannevar. (1945). *Science, the endless frontier. A report to the President*. Washington, D.C.: U.S. Govt. print. off.

KERRY FOSHER is a practicing cultural anthropologist who focuses on the integration of social science into decision-making in complex organizations. In her current role as Director of the Translational Research Group at Marine Corps University she directs the research projects of a multidisciplinary staff of social scientists. The group brings social science perspectives into military discourse on a range of issues including resilience, training and education, and ethics. Her publications have included ethnographic writing on homeland security, examinations of ethical challenges in working with the military, and accounts of practice in DoD. She received her PhD from the Maxwell School at Syracuse.

Contact:

kerry.fosher@usmc.mil
703-432-1504