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USMA's Minerva Research Initiative: Why Is Understanding Culture Important for the Military?

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It is no coincidence that in Roman mythology the goddess of wisdom and war were one in the same—Minerva. In many ways, today's military operations seem to continually push the limits that define complex issues in need of more and more of Minerva's wisdom. Because true system complexity can never be completely controlled or understood, it is only through Minerva-like wisdom that such extreme levels of operational complexity can be harnessed to produce a more informed and capable military. Napoleon understood the concept when he stated: "There are but two powers in the world, the sword and the mind. In the long run the sword is always beaten by the mind." This realization of the need for such wisdom in military operations is what motivated former Defense Secretary Robert Gates in 2008 to initiate Project Minerva to support and foster social science research and better understand the roles that culture and humanity play in military operations.

Today's military, much like governments and businesses in modern society, is based on the operations research (OR) premise that astute information processing can produce the knowledge to inform multiple-criteria, multidimensional decision making to yield sufficient wisdom to ensure operational success (Jensen and Bard 2003). No longer are military operations won by the most powerful physical force, but rather victory often goes to the smarter, information-dominant, culturally aware, net-centric force. Therefore, the US military needs to understand the cultural, social, behavioral, and political dynamics that shape the regions of the world that hold strategic importance to the United States. Through such wisdom, military leaders can better recognize the political trajectories of governments of countries where US military forces are deployed and meet the challenges of operating in complex socio-cultural environments. These operational issues spawn what is known as "wicked" problems,[a] which often need multi- and interdisciplinary approaches that require information science, operations research analysis, complex modeling, and social and behavioral science perspectives (Ritchey 2011).

Historical Background

The quantitative, information-based methodology of social and cultural reasoning began in the early 19th century, when Adolphe Quetelet and Auguste Comte incorporated statistical methods into the social sciences, thereby establishing the disciplines of demography and sociology and the beginnings of information science. By incorporating probability and statistics methods into social science, then called "social physics," they produced a quantitative basis for solving societal problems. Later, psychologist Jacob Moreno formalized the mapping of social relationships through what he called the sociogram to graphically represent individuals as points/nodes and the relationships between them as lines/arcs. For this work, he is credited with founding the basic principles of social network analysis[b] (SNA). These pioneers may not have been fully aware of the complexity of these phenomena and the massive amounts of associated societal data, but they were the first to use quantitative and qualitative reasoning to analyze these important issues. Quetelet's naïve view of data centrality that uses a concept called "the average man" extracted the mean and standard deviation from data sets to define and predict social phenomena. Although these metrics were sometimes misleading, the scientific method found its niche, as sociology became a science and society became a scientific data source. Quetelet's and Comte's colleague, Charles Baggage, applied these new methodologies and philosophies to develop quantitative-qualitative techniques to improve Great Britain's mail and railroad service. Geographer Carl Ritter took a similar track to develop the principles of human geography.

Nearly a century later, Quetelet's primitive tools and concepts were vastly improved upon by economist Vilfredo Pareto. His study of income distribution and human decision making hypothesized that incomes and other social phenomena follow power law probability distributions; thereby developing more insight into the underlying structural complexity of society. In his book, *Trattato Di Sociologia Generale (The Mind and Society)*, Pareto put forward the first social cycle theory to continue the development of the modeling framework for social science. Throughout the 20th century, as the social sciences become as mathematically based as the physical sciences, through the development of viable models and metrics of human behavior, the art and science of problem solving merged with public policy and OR. This forged a problem-solving methodology for the information and human issues in government, business, and industry. The Minerva Research Initiative continues this research thread by developing social science models for military issues and bridging the intellectual energies of military and academic institutions.

In the military realm, the multiperspective and quantitative-qualitative work of Omar Bradley and Dwight Eisenhower, along with the insights of British mathematicians to develop social science models during World War II, led to the emergence of OR as a formal discipline. People such as George Dantzig made great contributions to develop problem-solving methods and structures that provided effective decision making in areas such as economics, logistics, and communication. After World War II, OR, much like sociology and human geography[c] (HG), was applied to many social problems in government, industry, and society as it matured in its development to become the "science of the better."

The socio-models and quantitative-qualitative theories of today are even more empowering and insightful. In these models, social and environmental factors are considered in their influence on how individuals form into communities, and how these networks make decisions as groups. Some of the most comprehensive of these develop theoretical or computational models that combine sociology, psychology, cognitive and neuroscience, operations research, mathematics, and computer science. These models have been called social-cultural perspectives and are rooted in various subdisciplines, including social anthropology (Johnson 1996), behavioral ecology (Dunbar 1998), neuroscience (LeDoux 1996), social psychology (Bandura 1989), cognitive psychology (DiMaggio 1997), and computational science (Epstein and Axtell 1996; Carley 1991). Socio-cultural perspectives have become increasingly relevant for military operations to mirror the complexity of globalization, particularly as it relates to the speed at which ideological shifts and social mobilization can occur.

Military's Interest in the Social Sciences

A recent Department of Defense (DoD) study on models and metrics for social issues identified challenges and pitfalls and recommended a research plan that includes using network science (NS) in individual, organizational, and societal modeling for military issues (National Research Council 2005). This work spawned several DoD efforts that are specifically focusing on socio-cultural factors. This DoD R&D effort may transform the understanding and conduct of human affairs, which in turn may present challenges to the legitimacy of long-established, cumbersome institutions. For example, from a policy and organizational perspective, the United States may find it necessary to modernize and trans-

form its information and intelligence stovepipes to become more dynamic and adaptive collaborative networks. Such a development could provide leaders with information they can use to make decisions to attempt to manage the complexities of world politics. To get there, reliable data on human beings, as they function as interconnected consumers, warfighters, enemies, refugees, diplomats, criminals, and citizens of their respective nations, will need to be collected and assessed. NS, SNA, and HG can offer new approaches and solutions to minimize violence and ethnic conflict; prevent or manage warfare, pandemics, and poverty; protect the global commons; reduce income disparity; and negotiate the allocation of finite resources and space among nations and/or groups.[b] These new tools will help society manage its ever-growing complexity.

One of Minerva's goals is to improve basic understanding of the social, cultural, behavioral, and political forces that shape regions of the world of strategic importance to the United States. Its stated issue of concern is that:

"Twenty-first Century national security challenges reflect the complexity of globalization, including rapidly shifting geopolitical dynamics, increased pace of communication, and unprecedented social change. From climate change to failed and failing states and the rise of violent extremism, from the rise of new powers to ethnic strife, disease, and poverty, the United States will be forced to grapple with a range of new and daunting challenges." (http://minerva.dtic.mil)

Minerva research topics focus on:

- Strategic impact of religious and cultural changes
- Terrorism and terrorist ideologies
- Science, technology, and military transformations in China and developing states
- National security implications of energy and environmental stress
- New theories of cross-domain deterrence
- Regime and social dynamics in failed, failing, and fragile authoritarian states
- New approaches to understanding dimensions of national security, conflict, and cooperation

Minerva Efforts at USMA

In addition to its supported research projects, the Office of the Secretary of Defense (OSD) placed Minerva Fellows at the Joint Professional Military Education schools and Service Academies to combine its research efforts with the education of the military force. OSD awarded the United States Military Academy (USMA) two fellows to investigate "Social, Spatial, and Cultural Topologies of African Villages" in the Department of Geography and Environmental Engineering, and "Understanding the Differences in the Islamic Ideology and in Asian Cultures" in the Department of Behavioral Sciences and Leadership. These projects will function independently, but both will attempt to formalize models of societies to account for the connectivity of people, information, and resources through social, cultural, and spatial systems. These initiatives will lay the foundation for understanding how cultural norms and extreme ideologies are born and maintained, and further how failed communities can be stabilized and prosper (http://www.usma.edu/minerva/SitePages/Home.aspx).

The West Point Network Science Center (NSC), using the modeling and metrics of NS to complement and cooperate with the social science and HG methodologies, is supporting both projects. In addition to the nascent Academy research team, social

and behavioral scientists in the Army at the Army Research Office (ARO) and Army Research Institute (ARI) are connected to the USMA Minerva Initiative through support of their own research programs. The focus of much of ARI's research efforts is on developing cross-cultural competency training tools. They support various projects including computer-based and immersion-based trainings that enhance culturally appropriate negotiations skills, navigating social network structures, and reading nonverbal cues. In related research, USMA researchers, through support from ARI, examine network typology of leadership to better understand the social structural dynamics that are important in communication and cooperation.

The Minerva Research Initiative efforts are just being launched at the USMA. Collecting and using data on the connectivity of people, information, and resources to produce network models for the foundation of community stability and prosperity, the researchers on the project "Social, Spatial, and Cultural Topologies of African Villages" are seeking to understand how socio-cultural challenges develop and spread in the context of understanding conflict and cooperation in Africa. The research will examine the evolution of community governments, as well as the interactions between local networks, such as clans and tribes. This research will provide insight into how stable and productive structures and organizations develop and sustain themselves. SNA research pays particular attention to the synergistic and emergent roles within communities that are overlooked in strictly reductionist and hierarchical frameworks. For example, relationships among women within a community may play significant roles in coordinating the flow of resources throughout the community and thus contribute to the long-term quality and stability of education, healthcare, and technology. Furthermore, social scientist and HG researchers are investigating how leaders emerge from communities. By including the spatial component, SNA tools are showing how ideas, people, and resources diffuse—or spread—across territorial space. As the project matures, the USMA's Minerva work hopes to enhance cross-cultural competence among military personnel for activities in Africa such as security force assistance, stability operations, civil affairs, development initiatives, and theater security cooperation.

The project, "Understanding the Differences in the Islamic Ideology and in Asian Cultures," will focus on evolution of social network structures within the Muslim world to provide insight into how cultural norms and extreme ideologies are born and maintained. The approach for the study includes qualitative and quantitative data collection and analyses. Because Muslims across the world range widely in how they internalize and interpret their relationship to Muslim ideologies, a better understanding of the differences in cultural meanings around Islamic ideology can improve the US military's ability to relate with culturally diverse populations and conduct counterinsurgency operations more efficiently. Social and contextual factors play a role in driving some groups to embrace violent tactics to achieve political objectives. Social influences from both local networks (a person's direct family and friendship ties) and broader social networks (communities and large organizations) strongly influence an individual's attitudes. From sociological and geographical perspectives, individuals, groups, and entire communities can develop a set of shared values around their perceptions of US forces.

Many of the most pressing national security challenges demand an understanding of social science methodology, literature, and theory to produce effective support to decision makers. The NSC embraces these multidimensional approaches by using NS and SNA modeling and OR and HG tools to investigate complex social issues through support for projects involving interdisciplinary social science research for defense and national security applications. Therefore, the NSC, with its broad interdisciplinary team, is an ideal partner for the social science departments to conduct Minerva research. SNA has great potential in evaluating complex interactions of organizations and systems, by encompassing multiple perspectives to analyze and improve social, spatial, and cultural systems. The analytic focus of SNA is on relationships between individuals, unlike traditional analyses that center on the attributes of individuals. SNA helps to map the adoption and spread of specific attitudes and activities and pinpoints ideological tipping points within groups. Similarly, using geographic information systems (GIS) and HG perspectives, Minerva researchers seek to understand socio-cultural, economic, and political activities within the context of the geographic and political environment.[c]

The USMA's Minerva Initiative hopes to incorporate and integrate concepts from social science, human geography, OR, and SNA to evaluate complex interactions within an increasingly connected world and contribute to the DoD's goal of enhancing military strategies in vital regions of our world. As stated in the President's recently released *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* document, "The United States and its coalition allies and partners have learned hard lessons and applied new operational approaches in the counter terrorism, counterinsurgency, and security force assistance arenas…" Lessons learned from the past decade of counterinsurgency and stability operations have proven that while we might acknowledge there was a need to culturally understand the environment in which US military forces were operating, we now can apply tools, such as NS, HG, GIS, OR, and SNA, to provide insight into future operations of all types and levels. Self-knowledge from within military operations and examining the cultural make-up of countries that are of national security interest may contribute by bridging academic insights to operational context. This will strengthen and ground the future of US military operations with the Minerva wisdom to encompass more precise planning and execution in the future.

Notes

[a] Wicked problems are those that cannot be solved by applying known methods; they demand inventive models that are often elaborate, adaptive, and innovative. Often the models for wicked problems involve elements of systems or complexity theory.

[b] Network Science (NS) and Social Network Analysis (SNA) are emerging modeling methodologies that use dynamic web structures that include entities (nodes) and their relationships (links) in addition to system processes and entity attributes.

[c] Human geography studies the world through models of people, communities, and cultures in a spatial context that is other provided from data provided by geographic information system (GIS) tools.

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Chris Arney is a network mathematician serving as professor of mathematics and Endowed Chair of Network Science at the United States Military Academy. He retired from active duty after 30 years of Army service, and after serving as a vice president of a university, he spent five years as a program manager for the Army Research Office. He enjoys teaching mathematics and network modeling courses to cadets and supervising cadet research projects. Currently, he is a member of the MAS Council acting as liaison to MORS. ■

Happy Birthday Gene Visco!

This year, Gene celebrated a milestone birthday. Now that he's 85 years young, the entire MORS community celebrates his contributions to military operations research, his leadership in MORS, and his friendship.