2017 MINERVA RESEARCH INITIATIVE TOPICS OF INTEREST

See full Funding Opportunity Announcement for further details

The following Minerva interest areas indicate domains of inquiry relevant to the Department of Defense. Interest areas are not mutually exclusive and proposers are not limited to the questions, scope, or regions listed. Researchers should aim to balance the specificity of their proposed research with the generalizability of the expected results. See the FY 2017 Minerva Funding Opportunity Announcement for proposal evaluation criteria.

Proposals may leverage existing data or, with justification, collect new data. Preference may be given to studies by experts capable of analyzing source material in the original languages and to studies that exploit materials that have not been previously translated. The DOD also values geospatially-referenced data across multiple geographic scales gathered in the course of research. It is expected that collecting viable empirical data relevant to context and situation may require field research, which is looked upon favorably.

Researchers are encouraged to incorporate novel research methods. Well-theorized models linking micro and macro analyses and cross-method approaches, such as simultaneously using both inductive and deductive analytic strategies, and qualitative and quantitative methods are also of interest. Proposals should be fundamentally rooted in the existing social science research literature and have a clear basic science component that describes the future utility of the insights the research will generate for social science.

Disciplinary approaches of interest include, but are not limited to: anthropology, area studies, cognitive science, demography, economics, history, human geography, political science, psychology, sociology, and computational sciences. Interdisciplinary approaches are strongly encouraged, especially when mutually informing and/or cross-validating (methodological integration). Researchers need not focus exclusively on the contemporary period, but they must be able to explain the relevance of findings to contemporary DOD strategic priorities.

The 2017 Interest Areas are situated within DOD strategic priorities that reflect the general, department-wide interests and those more specific to each Service. There is, of course, overlap and collaboration between the respective interest areas, but in framing their proposals researchers are encouraged to consider both the area of interest and the general context of needs it represents:

- General Interest Area: Sociality, Security, and Interconnectivity
- Special Interest Area 1: Understanding the Social Impact of Autonomy
- Special Interest Area 2: Societal Resilience and Sociopolitical (In)stability
- Special Interest Area 3: Power and Deterrence for Shaping Operations
- Special Interest Area 4: Military Cyber Defense

A. General Interest Area: Sociality, Security, and Interconnectivity

POC: David Montgomery, OSD (Policy) Strategy & Force Development, and ASD (R&E) Basic Research, david.w.montgomery61.ctr@mail.mil

Recognizing that all issues of security exist within a social context, the Department of Defense seeks to enhance the basic social scientific understanding of factors contributing to social stability or conflict; processes of community formation and dissolution—including how communities construct meaning and value that drive political and collective action; and the impact of differing cultural visions on security at micro, mezzo, and macro levels. Most generally, this interest area concerns a focus on conflict vis-à-vis the mechanisms of sociality. It is interested in research that offers innovative, interdisciplinary insights into thematic topics including:

- Influence of social, political, economic, and environmental change on identity, group cohesion, and the ability to live with diversity. Such changes of interest include those influenced by labor migration, refugee displacement, urbanization, and shifts within the existing global order. Among the numerous factors worth consideration: the influence of trade and trade networks, shifting employment opportunities, and income inequality impacting livelihoods and stressing communities; how perceptions of insecurity are impacted by demographic shifts and the long-term consequences of such changes; and how changing populations and group-divisions influence various structures of governance (democratic or otherwise) differently.
- The role of great-powers in managing global stability. How are traditional and emerging great-powers'—including but not limited to China and Russia—understandings of security impacted by the social, cultural, and political environments in which they exist and what factors hold together the ability of great-powers to mobilize within and beyond their territories? How do structural changes among various states impact global order? Do changing ideological visions impact the utility of multilateral alliances? How do non-state actors influence established state mechanisms for managing conflict?
- The impact of intervention or failure to intervene. How can one more efficiently understand the social, political, economic, and environmental consequences—short, medium, and long term—of engagement? How do understandings of engagement across different international and cultural contexts influence outcome and effectiveness? How are national and regional interests managed, especially in relation to varying understandings of obligation and responsibility that are at times framed morally in individual, communal, and/or ideological terms? Are capacity building programs effective and if so, at what level are their successes context and culturally specific and where are approaches generalizable across different cultural environments?
- The evolving role of global interconnectivity in relation to understandings of connectedness within communities of belonging. How do economics, politics, environmental change, and ideological visions influence social relations at the micro, mezzo, and macro levels? What underlies changing relations within communities and how are counter-hegemonic movements understood differently by states and individuals? To what extent do these differences in understanding reflect the substance of alienation or the challenge of competing visions of community? How do different understandings regarding the primacy of individuality and communality impact the coordination of activities between states and cultures? What factors—including social media and cyber-related interactions, as well as more traditional forms of knowledge transmission and communal engagement—most influence social cohesion within and across different parts of the world?

B. Special Interest Area 1: Understanding the Social Impact of Autonomy

POC: Benjamin Knott, Air Force Office of Scientific Research, benjamin.knott.2@us.af.mil

The technologies of autonomous systems including artificial intelligence, machine learning, and robotics will be transformative to the DoD as well as have tremendous societal and economic impacts. Autonomous systems will revolutionize military operations across all services, complement and augment the capabilities of our warfighters and peacekeepers, and enhance national and homeland security. In addition these technologies will have sweeping social impacts, changing many aspects of how we live, learn, and communicate, including the potential to increase economic prosperity. The DoD is investing heavily in this area and recently commissioned a Defense Science Board Summer Study on Autonomy to make "recommendations to identify the science, engineering, and policy problems that must be solved to permit greater operational use of autonomy across all warfighting domains." While significant resources are being invested in developing the collection of technologies needed to achieve robust autonomous systems, many questions remain about the policy of autonomy including the use and ethics of autonomous weapons systems, the effects of robotics on the performance of human-machine teams, social impacts and support from local populations for US interests, and the economics / logistics of pervasive autonomy. Support is needed from the social science community to examine the social, cultural, psychological, political, economic, and ethical impacts of these advances.

Sample topics include:

- The disruptive effects of autonomous systems on military affairs and society at large
- Psychological effects on human operators of autonomous systems (e.g., it is known that the operators of remote UAVs often experience PTSD and other problems even though they are not directly vulnerable to harm)
- Issues of reliance and trust when humans team with intelligent autonomous systems which are expected to learn and therefore evolve their behavior over time
- The unintended consequences of autonomous / robotic systems on attitudes, trust, and support for US operations
- Effects of autonomous / robotic systems on decision makers willingness to take risks and use force
- The societal impacts of military autonomy technology crossing over to civilian applications
- How social and moral norms shape the adoption of autonomy
- How does reliance on autonomy shape individual and organizational decisions. For example, in human organizations, delegating serves to increase the moral distance from the consequences of one's actions. Might operating through a combat robot decrease empathy and increase dehumanization of others?

C. Special Interest Area 2: Societal Resilience and Sociopolitical (In)stability

POC: Lisa Troyer, Army Research Office, lisa.l.troyer.civ@mail.mil

The Department of Defense hopes to better anticipate and potentially mitigate instability and conflict through basic scientific research on factors that affect resilience to "shock" events (e.g., violent attacks, economic turbulence, social unrest, public health crises, environmental change). Such events have the potential to unsettle existing social structures, processes, and institutions, including markets, governance structures, population shifts, kin groups, educational systems, and delivery of healthcare, making regions vulnerable to upheaval and risks to the well-being of the population. Yet, some systems exhibit greater resilience to these shocks than others and the Department of Defense is interested in promoting greater understanding of contributors to resilience. The social structures, processes, and institutions that impact resilience and instability exist in a global system with complex relationships between components that are difficult to predict and model. They entail interdependencies between social systems (e.g., norms, values, governance, demographic trends), natural systems (e.g., environmental systems, including shifts in resource availabilities due to human-caused and naturally occurring changes), and physical systems (e.g., human-built systems like megacities, social infrastructure that includes communication, transportation, and cyber systems), which often span groups and nation states. This Minerva interest area aims to harness innovative, multidisciplinary social science research to better predict these dynamics. Areas of interest include, but are not limited to, dynamics of ungoverned, misgoverned, and contested regions; population migration and urbanization; effects of demographic trends on sociopolitical (in)stability and opportunity; security implications of changes in resource availability and resource control, including illicit trade and trafficking in all domains; and global interdependencies across trade and political systems. Approaches could incorporate different levels of analyses from small groups to cross-cultural interactions across large-scale collectives.

D. Special Interest Area 3: Power and Deterrence for Shaping Operations

POC: Martin Kruger, Office of Naval Research, martin.kruger1@navy.mil

Power is projected (e.g. conventional attack, cyber/information attack, economic action, diplomatic pressure) and deterrence strategies (if-then threat involving power) are used to make it more likely that "someone" will make a decision that is more favorable to someone's interests and values. Compared with the relative certainty and stability of the cold war, the pace of introduction of new global threats has seemingly increased in recent years. These threats are coming from resurgent near peers, rogue states as well as cross border networked terrorist organizations. Unfortunately as the numbers of hot spots raises so have power projection and deterrence options (e.g. information warfare, cyber-attacks tied to economic consequence). The current lack of decision support tools makes selecting the best power and deterrence strategies to a decision shaping objective for very diverse global hot spots challenging. New fundamental theory is needed to understand the potential and limitations of power and deterrence options and to understand how to develop predictive capabilities.

Example of power projection includes everything from information warfare/cyber to action intended to affect economic conditions; diplomacy to kinetic attacks. Deterrence strategies can include those options as threats as well as carrot and stick approaches (e.g. aid funding, Foreign Military Sales (FMS), stability force training).

This interest area asks if it is possible to know how effective a power or deterrence strategy will be in shaping the future of a specific hot spot and whether there are any generalized theories that would allow lessons learned in one region to be applied to another region. Theories that establish causality between action and outcome and action and prediction is desired.

The overall objective of this research track is to offer new theories, models, and approaches to power projection and deterrence strategies and their ability to shape an area of interest. The research hopes to make it easier for US and allies to identify the best power and /or deterrence strategy for a given situation and to recognize when a threat has selected a power/deterrence strategy that is predicted to be their most dangerous option for the US and allies.

Areas of interest include the use of power projection/deterrence actions on/between non-state institutions, rising military powers and rogue states and the use by those states on US and Allies.

<u>Power projection</u>

• Drivers affecting how a state or states influence others through the projection of power.
• The changing balance of power between the state and other traditional and non-traditional institutions (e.g. who can project power).
• For power projection techniques, what observables (direct and/or proxy) can be used to determine if actions are effective?
• Novel approaches for validating the causal dynamics between specific *power projection strategies (diplomacy, information, military, and economic* (DIME)) actions and outcomes.
• Advancing theory that allows a prediction of outcomes resulting from power used by A on B.

<u>Deterrence Theory</u>

• Drivers affecting how a state or states decide how to deter decisions made by others or restrict a decision space
• The changing balance of power between the state and other traditional and non-traditional institutions (e.g. who can successfully deter).

• For deterrence techniques, what observables (direct and/or proxy) can be used to determine if actions taking are effective?
• Novel approaches for validating the causal dynamics between specific deterrence strategies and outcomes.
• Advancing theory that allows a prediction of outcomes resulting from a deterrence action used by A on B.

Beyond conventional deterrence and power projection
• The development and analysis of general frameworks for escalation dynamics where power or deterrence actions cause reciprocal power and deterrence action.
• Theory governing the use of power and deterrence concurrently.
• Novel approaches for validating the relative importance of each action taken (power and deterrence) in causing observed outcomes
• Advancing theory that allows a prediction of outcomes resulting from multiple power and deterrence actions

Area studies
• Social, cultural, and historical factors affecting the success or failure of power projection or deterrence actions applied to an area to shape decision spaces.
• Social, cultural, and historical factors affecting the choice of power projection or deterrence actions taken by actors trying to shape the decision space of others.

Influence Operations
• What combination of projection and deterrence techniques and under what conditions have been shown to be more successful in creating decision outcomes that are more favorable to US and Allied interests.

E. Special Interest Area 4: Military Cyber Defense

POC: Harold Hawkins, Office of Naval Research, harold.hawkins@navy.mil

The potential for disruptive cyberattacks by malicious state and non-state actors on the military capabilities of the U.S. and its allies is a major and growing concern of the Department of Defense. The significance of these attacks relates to their capacity to compromise the effectiveness of military operations under hostile conditions where timely and accurate cyber performance is essential to mission success. This Minerva interest area seeks innovative multidisciplinary research, entailing contributions from Social, Behavioral, Statistical and Computer sciences, to develop empirically validated conceptual frameworks, formal models and computational tools to address two major issues of concern. The first is the ability of military personnel to quickly detect that their assets are the targets of cyberattack rather than due to degradations caused by system (hardware or software) malfunction or, for example, atmospheric interference or own force sources. Under many conditions, the latter causes of cyber disruption are more common than is cyberattack. As a consequence, troubleshooting activities, some highly time-consuming, could initially be focused on these more likely causes. An additional challenge in detecting malicious attack is that such attacks could produce consequences that are not immediately noticeable. The resulting delays in appropriately responding to cyberattack have the potential to compromise mission effectiveness in high tempo operations. Consequently, validated approaches are needed to quickly and effectively determine that military units are under cyberattack.

A second cyberattack issue of military concern is determining the state or non-state source of the attack. A number of factors could be considered when determining source attribution, including the target, the target systems disrupted, attack timing, hostility context, and signature characteristics of the attack. An overarching conceptual framework and specific computational toolsets are needed to integrate these and other sources of information to determine likely attack sources and the uncertainty associated with this determination. Desirable features of proposed solutions include: (1) the design of user interfaces that enable easy use in confusing high tempo operations environments and support rapid decision-making, and (2) modeling that is robust enough to support analysis without reach back or updates from higher command levels because of the possible compromise of cross-echelon communications in a cyberattack environment.

Because the techniques and sources of cyberattack will evolve over time, becoming more diverse and challenging, the conceptual frameworks and analytic tools sought in this Minerva Interest Area must be developed to be modular and capable of extensive scale-up. Finally, the frameworks and tool sets should be empirically validated. A possible validation strategy would be to develop, tune, and then evaluate the efficacy of frameworks and tools using an existing cyber incident dataset that contains ground truth. At least one such dataset exists in the public domain (Dyadic Cyber Incident and Dispute dataset). In this suggested strategy, part of the dataset would be used to develop approaches and the remainder would be exploited to test the validity of these approaches.