



MINERVA RESEARCH INITIATIVE

FY22 Minerva Topics of Interest

Below represents the Minerva topics of interest for the FY22 funding competition. In framing any Minerva proposal, it is important to articulate the basic science contribution of the research proposed. It is expected that all proposals will have sufficient area and subject-matter experience to appreciate the nuances of diverse local contexts—including the (ethical) challenges posed by different value systems—and proposers are strongly encouraged to review the 2019 Future Directions in Social Science report on the [Emergence of Problem-based Interdisciplinarity](#) as a reference for the program’s strong interest in supporting projects that are disciplinarily diverse and committed to addressing problems in innovative ways. It is also expected that proposals utilize both qualitative and quantitative approaches and include validation strategies of the research findings and potential impacts. Further, the program is interested in how the theoretical and methodical approach of the proposed research is generalizable such that it could influence how similar problem sets are approached.

Successful proposals will in some clear way align with the most recent [National Defense Strategy](#). As well, there is strong interest in research proposals partnered with Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) and other appropriately diverse teams, such as Professional Military Education Institutions, especially as they contribute different perspectives on the social dynamics of the challenges posed below.

- Topic 1: Socio-economic vulnerability to climate change
- Topic 2: Deterrence in the Future Operating Environment
- Topic 3: Russian Speakers in Online Spaces
- Topic 4: Power and Influence in the Era of Strategic Competition
- Topic 5: The Arctic as a Polar Crossroads
- Topic 6: Management and Information in the Defense Environment

TOPIC 1: SOCIO-ECONOMIC VULNERABILITY TO CLIMATE CHANGE

POC: David Montgomery, OUSD-R&E, Basic Research, david.w.montgomery61.civ@mail.mil

Climate and environmental change is increasingly accepted as a major issue facing societies, and a defining global challenge with significant potential to reshape future security and stability. As outlined in the [DoD Climate Risk Analysis Report \(2021\)](#) the associated risks include mass migration, altered patterns of infectious disease, water and food insecurity, degraded livelihood systems, political instability, global conflict, and social dis cohesion, as well as adverse effects on key economic sectors. The varying pace that developed and emerging economies can develop and implement climate change policies, may also be a consideration for political activism and national security.

Socio-economic impacts of climate change will vary across spatial scales, with some societies less resilient to climate-related shocks. Socio-economic factors that determine a region’s adaptive capacity can include technology and infrastructure, information, knowledge and skills, institutions, equity, social capital, and economic development. Developing nations are sometimes considered more vulnerable because of relatively high dependence on climate-sensitive sectors, low incomes, and weak

adaptive capacity.

This Minerva topic seeks to develop new approaches to studying dynamic relationships between climate change impacts and socio-economic systems, and to assess the implications of those relationships for national security and future Defense policy. Ideally, data and models will capture longitudinal relationships and identify potential policy considerations.

Questions of interest for this topic could include:

- What are the relationships between climate change, the performance of economic institutions and critical economic sectors, and national security? How are different types of economic systems affected by the social and political responses environmental change?
- How have state actors exploited environmental vulnerabilities or crises for coercive means, and what lessons can we draw for a world of increasing climate-related hazards?
- How do we measure the impacts of climate change on the value of ecosystem services across different levels of society, and how will these impacts affect different aspects of national security?
- How does the nature of economic interdependence (or isolation) affect the management of environmental challenges across various geographic and political-economic scales?
- How can emerging technologies help to mitigate the negative socio-economic impacts of climate change? How does this vary across different societies? Where might these opportunities intersect with existing DoD technology programs?

TOPIC 2: DETERRENCE IN THE FUTURE OPERATING ENVIRONMENT

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Integrated deterrence is at the center of the forthcoming 2022 National Defense Strategy and entails working seamlessly across warfighting domains, theaters, the spectrum of conflict, other instruments of U.S. national power, and America's network of Alliances and partnerships.

This topic focuses on predictive models of deterrence and/or escalation management strategies and seeks to develop understanding on whether generalized theories allow lessons learned in one global region to be applied to another region. Theories that enable causality or forecasting between strategic action and outcome are also sought. Specific areas of interest include deterrence logic for hostile states, non-states and proxy actors. A multidisciplinary approach to generating new theories and methodologies is needed, as well as an emphasis on empirically tested or theoretically founded strategic decision support tools.

Specific foci may include, but are not limited to:

- How do different deterrence logics apply across a range of circumstances and domains?
- What are the perspectives of deterrence across different government agencies, allies and partners? Where and why can perspectives be misaligned or deviate? How can we better understand and measure the effects of assurance on partner's and allies' defense

policies?

- How do we understand competitors' perceptions of military and non- military signals, and integration of multiple sources of information, messaging and other gray zone activities?
- Scientific evidence to understand how a potential adversaries' domestic political considerations can influence decision-making on the use of force.
- How can historical lessons on successes and failures of coordination between diplomatic and military strategies inform the development of future deterrence strategies?
- How can the deterrence effects of diplomatic, informational, military and economic activities be measured and assessed?
- How does perceived or realized resource competition influence thinking about escalation and deterrence?
- How does technology (current and emerging) impact traditional deterrence-thinking and does it do so differently across different domains?
- Theory and empirical evidence to understand the deterrence effects of revealing or concealing capabilities in different technological and strategic contexts.
- What are the implications of cyber and space-related technologies for general and immediate deterrence, and nuclear escalation risks?
- Empirical evidence to understand nuclear-escalation risk in immediate deterrence crises and early stages of armed conflict.
- How can deterrence thresholds be set, and how can these be effectively communicated to potential opponents?
- How can deterrence strategic outcomes be assessed as well as account for outcomes connected to unrelated events and circumstances?
- What are the approaches for validating causal dynamics between specific deterrence strategies and outcomes?
- For deterrence drivers, what observables can be used to determine if actions are effective across multiple domains? How can they help predict second and third order consequences of these deterrence drivers?
- Scientific evidence to understand how to identify the what and where to increase defense resilience in order to strengthen deterrence?

TOPIC 3: RUSSIAN SPEAKERS IN ONLINE SPACES

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Russian-speaking diasporas and populations express their opinions, viewpoints and knowledge about social, economic and political affairs in social media, though these discourses are difficult to locate (using current methods) and difficult to interpret, given the problem of language and cultures. Russian speakers have a significant global reach and online users occupy many platforms, including platforms rarely studied for example, Vkontakte and OdnoKlassnik, as well as more popular platforms such as YouTube. Recent events in Ukraine are capable of causing substantive ripples in Russian popular culture as expressed in digital and social media; and information conflicts with the propaganda efforts of the Russian media complex of state-owned and state-dominated platforms.

An important feature of information conflicts online is the implicit difficulty of controlling counter-narratives in online spaces. This effort should aim to characterize the landscape of stance, opinions and themes and the techniques of influence in Russian-language discourses, such as the role of trolling and its techniques, the use of disinformation and propaganda, and the social networks and communities that both support and resist state narratives. Implicit in this effort would be an exploration of modern Russian youth culture and the efforts by the Russian state to contain their opinions and perspectives. The successful effort would provide important, breakthrough understandings of online influence, particularly as practiced by determined propagandists in new (Tiktok), legacy (Facebook, Twitter) and language-niched spaces (Vkontakte, OrdnoKlassnik) or similar.

Respondents should have cultural expertise in Russian language, and in the social platforms where narratives are propagated. Expertise in social movement theory, influence theory, and media criticism would be helpful and expected. A strong understanding of social media algorithmic manipulation and its application to common Russian social media platforms is also likely to be helpful. “Culture-at-a-distance” techniques to study the Ukrainian war in particular would be advantageous. Researchers in communications, journalism, sociology, anthropology, social psychology, and Russian studies are encouraged to apply.

Expertise in social media on a variety of platforms such as Tiktok, Vkontakte, OdnoKlassnik and other social media platforms is expected so that information scientists and computer scientists with appropriate social science background and experience are also encouraged.

This Minerva topic aims to expand the description of advanced information warfare techniques and maneuvers and provide an understanding of adversarial disinformation architectures, methods and techniques. The research should contribute to strategic information environment assessment, providing insights, metrics, and descriptions that will inform the development of new theories of information warfare in online contexts.

Specific areas of interest include:

- Improved scientific understanding of techniques and methods of propaganda targeted at Russian speakers, particularly in online spaces.
- New metrics to measure effectiveness of competitive narratives that offer an alternative to Russian narratives.
- Improved scientific understanding of how to identify and assess coordinated attempts to influence populations through intermediaries.

- Descriptive models that assess the expected outcomes of Russian online propaganda techniques.
- New methods that measure the behavioral effects of online propaganda on Russian speaking populations.

TOPIC 4: POWER AND INFLUENCE IN THE ERA OF STRATEGIC COMPETITION

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Power and influence are prevalent social science terms, and they often overlap/intersect in their application to relationships between/among individual(s) and group(s) that often extend to other, sometimes larger, systemic socio-political, economic, and/or legal relationships. While the concepts of power and influence are ancient, the definitions and usage of these terms have shifted over time to reflect the changing nature of governance, warfare, technology, and even the international order. The historical philosophical bases for these concepts, at least from a Western lens, date back at least to Aristotle in written format, and despite healthy debate and growth, the succeeding literature has often maintained a pro- Western bias that has, perhaps unintentionally, limited the amount of non-Western perspectives that contributed to the scholarship. While translation and other dissemination issues may be compounding factors, the lack of available non- Western or decolonized conceptualizations complicates comparisons and assessments of how other nations and/or subnational groups utilize these concepts in ways that might be less visible or even invisible to the West. Historically, for example, power has been considered finite in some parts of the world, with losses or gains transferred through land, property, or other exchange and then perpetuated through societal memory to cement one person/group benefiting over another. In contrast, the rags-to-riches genre suggests that power can be gained and lost in other parts of the world, albeit not necessarily at a cost to another person or entity.

Social media has introduced more fluid concepts of power that permit individuals to become “influencers,” although the magnitude of this trend may vary across societies. The existence of technology-enabled influence is hardly novel, but how critical is the role of technology in establishing power and asserting influence?

The extent to which technology has altered or redefined power and influence in policy and practice is underexplored and has potential implications for national security and deterrence. It seems plausible that technology would augment power and influence to some degree, yet it is unknown whether it could become a standalone lever. Should or could technology equate to a lever of national power or as a component thereto are open questions, and technology may not be alone as a potential lever or component thereto; there may be additional elements that merit further consideration in the context of power and influence.

To further situate one relevant historical evolution of power and influence, British diplomat and historian Edward Carr produced a framework for national power in 1939. He described political power as being the sum of military power, economic power, and power over [public] opinion. This model later transitioned to DIME (Diplomacy, Information, Military, Economy) at the start of the Cold War and, through the counterterrorism community in the early 2000s, evolved to DIMEFIL, MIDLIFE, MIDFIELD, and other derivative acronyms to analyze and craft policy. In today’s era of strategic competition, a time that is still redefining itself in terms of interconnectedness, ideology, and geopolitical recalibration, some

researchers have started to consider whether other instruments of power may exist, and how they affect an actor's ability to exert or succumb to influence. Other potential instruments range from technology to economics, education, culture, [outer] space, etc., and explore what threshold an instrument must reach, whether instruments should be weighted the same and, if not, what circumstances require redistributed weighting. Interrogating these models and addressing any deficiencies is only part of the issue, however, as other nations, subnational groups, and international organizations may conceive power and influence differently. Thus, there may be multiple entities playing by different rules who translate alternative concepts into levers that increase their international power projection capabilities.

This topic seeks research that, at minimum, interrogates the concepts of power and influence from multiple perspectives, identifies similarities and differences where they are present, and considers the implications of these findings. Further, the topic seeks efforts that develop and test models related to national levers of power and influence, from Western and non-Western perspectives, with consideration for determining which model(s) best align with the era—and evolution—of strategic competition.

Suggested empirical questions:

- How do concepts such as power and influence differ by nation and, when relevant, entity? To what extent are definitions from Western and non-Western perspectives comparable? If they vary, what are the gaps between/among them? What opportunities might these differences reveal?
- What role does technology play in current and/or emerging levers of national power? If it can stand alone, what implications does it have for current and future policy? If not, what are the dependencies?
- What is the threshold for a concept or capability to become a lever of national power? If there is a threshold, do the traditional instruments still exceed it? What emerging instruments meet or exceed it? To what extent can entities influence this threshold or instantiate/neutralize a lever?
- Should instruments of power be weighted, and if so, how? What role might context (e.g. global, local, cultural, societal, etc.) play in changing or maintaining a proposed weighting system?
- With the many types of power, such as hard, soft, smart, sharp, etc. but may not be exhaustive, which of these types are equivalent across [sub]national definitions? Different? Which actors may use other, as yet unidentified, types of power? What implications do these findings have for integrated deterrence, which must consider influence across multiple domains and the spectrum of conflict?

- To what extent are nations and entities using the same levers? If they conceive power and/or influence differently, what are the similarities and differences, or how might they be identified?
- How do differences in power and influence inform concepts such as surprise and deterrence? Once understood, how do they enrich and/or complicate emerging understanding? To what extent might they differ in specific domains, such as space and cyber?
- What indication(s) may exist to suggest that an action will/will not occur based on another actor's definitions of power and/or influence?
- How do new levers, should they be identified, translate into emerging international power projection capabilities?
- What framework(s) and/or model(s) most accurately reflect power and influence in strategic competition? What extensions, if any, are needed to consider it holistically and across multiple domains? How can these concepts be measured?

TOPIC 5: THE ARCTIC AS A POLAR CROSSROADS

POC: Laura Steckman, Air Force Office of Scientific Research, laura.steckman.1@us.af.mil

The Arctic is growing in its geostrategic and geopolitical importance. The region is comprised of multinational actors to include the Arctic states, indigenous peoples and their organizations, many of which are recognized sovereign nations, and international observers, many of whom have no geographic proximity to the region, at a time when it is experiencing increasing socio-economic, governmental, environmental, and international pressures that make the region a “polar crossroads of globalization, commodity extraction, and environmental protection/degradation” (Moscatto, 2020). It is also becoming more interconnected with [outer] Space for reasons of security, communications, astronomy, and meteorology, among others, adding additional complexity to its importance as a geographic region. At the same time, as the region experiences change it is opening, allowing for new industries such as increased tourism that economically enhance and environmentally challenge the region with greater human mobility.

In addition, retreating sea ice and glaciers are creating new passageways for transportation and shipping, yet also increasing negative impacts, such as pollution, that will cause further ecological impact to marine environments. Taking all of these factors into account, it becomes clear that humans are fundamental actors at these crossroads. Humans are critical agents who simultaneously drive and experience the effects of change, whether these changes occur from climate change, environmental transformation, technology... or to culture, security, and sustainability. The presumed opening of the Arctic, as well as growing global interest in its lands and resources, will undoubtedly continue to introduce opportunities and tensions.

Strikingly, despite the immense role that people have in and on the Arctic, as acknowledged in Arctic policies and actors, such as those of the Arctic Council, that reference the human dimension, peoples, and communities; governance; and indigenous knowledge and rights; social science research is substantially under-supported compared to the natural and physical sciences. Several recent analyses on the breadth of Arctic research confirm the need for social and multidisciplinary research on the region to understand the issues affecting it. Such studies are of particular importance to security and defense. The 2021 US Interim Nation Security Strategy calls to “promote a favorable distribution of power to deter and prevent adversaries from directly threatening the United States and our allies, inhibiting access to the global commons, or dominating key regions” and “lead and sustain a stable and open international system, underwritten by strong democratic alliances, partnerships, multilateral institutions, and rules.” There is a need to understand the humans and activities directing and affecting the future of the crossroads that drive [un]intentional change and how the transformations occurring in the region are shaping the lives and futures of Arctic peoples, states, and global interests.

This topic seeks research that explores the opportunities and challenges in the Arctic that stem from multiple, simultaneous realities such as a changing physical and ecological environment, increasing access and human activity, introduction and adoption of new technologies, and evolving strategic competition. All research proposed must, to some degree, address the human dimension of the Arctic. Proposers anticipating fieldwork in indigenous territories are strongly encouraged to provide evidence in the technical narrative and/or letters of support to demonstrate local concurrence for and/or partnering in the research.

Specific areas of interest include:

- Cooperation and competition in the Arctic, e.g. how these activities may be occurring simultaneously among actors, the mechanisms that affect cooperation and competition, modeling and/or predicting current and future trends
- Opportunities and challenges to developing culturally-appropriately regional digital infrastructure and digital security, which may include consideration for new technologies that could introduce additional societal disruption(s), resiliencies, and vulnerabilities across the region
- Factors that affect mutual understanding and cooperation in the region, to include consideration for local peoples and/or regional and international influence
- Impact of societal change due to trends in development, climate and environmental stressors, international interests, and increasing human activity

Moscato, D. (2020). The Amplification of Polar Diplomacy: A Textual Analysis of Arctic Council Declarations. *Arctic Yearbook*, 1-14.

TOPIC 6: MANAGEMENT AND INFORMATION IN THE DEFENSE ENVIRONMENT

POC: Greg Ruark, Army Research Office, gregory.a.ruark.civ@army.mil

This topic evolves out of the Department's emphasis on Defense Reform as a pillar of the National Defense Strategy, the continual identification of DoD management activities on the GAO's High Risk List, and the 2018 Future Directions Workshop on the intersection of Management and Information Sciences and its corresponding report on the [Emerging Sciences and Their Applicability to DoD R&D Management Challenges](#). Management science and information science emerged in response to particular organizational needs: management science to the global scale of military and industrial global operations and information science to the growing presence/influence of digital data in contemporary society. Each of these two sciences afford rich opportunities to fundamentally understand and provide insights into management and information challenges facing DoD as it seeks to modernize and reform its management and business practices, and make better use of its management data collection and analysis capabilities. This topic seeks to explore how management and information science can contribute to understanding organizational structures and the challenges to and opportunities in efforts to modernize DoD management, scientific, and bureaucratic processes and ecosystems. Research activities will also help elucidate what data sets and sources should be made available to researchers by the DoD to support further constructive engagement with the management science and information science academic community.

Motivating research questions and issues that can be addressed include, but are not limited to:

Organizational Change and Development

- Develop models that take into account the need for strategy formulation, not just strategy execution; the challenge presented by multiple stakeholders without a unified overarching hierarchy; the multiplicity of interests involved in any prospective change; the accelerating and highly variable rates of technological and social change; challenge of organizationally incentivizing collective interests over more narrowly-defined interests; etc.
- Develop sophisticated theory and models to guide the transformation of institutions into agile organizations that enable rapid adaptation of policies, priorities, and investment to maintain competitive advantage;
- How can we better understand cultural change and development, across a multigenerational workforce operating in the DoD hierarchy?
- How can we best mitigate risk aversion in complex, bureaucratic organizations such as the DoD?
- How can a "systems of systems" architecture be developed—and data be aggregated—that facilitates portfolio management beyond the program level; enhances Joint Force, Service, and OSD coordination and cooperation; assists the transition of research insights across the Department; etc.

- How can the DoD assess costs and impact with imperfect information, particularly as it relates to evaluating institutional inertia relative to the challenges of managing risk in an ever-evolving research and operational environment?
- How can the DoD maintain the current structure and processes needed for addressing current operational challenges while concurrently experimenting with developing alternative structures and processes needed for emerging operational challenges?
- How can the DoD measure the warfighting advantage provided by the department's diversity and inclusion policies?

Research and Development Pipeline

- Identify alternative frameworks to the current linear progression of research to understand the reciprocal relationship between the different research activities (Basic, Applied), Development, and Application to understand the development life-cycle, resource requirements, and DoD stakeholders;
- Develop advanced models accounting for current federal government and industry R&D activities to create for DoD a diversified R&D research portfolio that will inform investment prioritization (lead versus support) and level (amount).
- How can planning, budgeting, and financial management policies be tailored to match the speed needed to counter emerging threats and take advantage of new technological opportunities?

Supply Chain Management

- What approaches can enable the DoD to identify fair pricing in acquisition circumstances where there is only one prime contractor and only one customer? What are the best models to establish a fair price in the absence of a true market? How can DoD identify fair prices for weapons systems and capabilities that are intended to have a deterrent effect and not intended for operational use?
- How can we anticipate and address the erosion or complete collapse of a sub-tier capability in the supply chain? How can we assess what supply chain logistics reform is needed?
- How can we model the department's supply chain human resources and manufacturing capacity needs? What approaches can enable the DoD to assess the Science, Technology, Engineering and Mathematics (STEM) talent pipeline and national and global ecosystem?
- How can we better understand and assess trust in the sociotechnical supply chain system

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