FY21 MINERVA RESEARCH INITIATIVE TOPICS OF INTEREST

Below represents the Minerva topics of interest for the FY21 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 Intuitions (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.

See the complete FOA (WHS-AD-FOA-21-01) on grants.gov for submission instructions.

Topic 1: Social Implications of Environmental Change
Topic 2: Resource Competition, Social Cohesion, and Strategic Climate Resilience
Topic 3: Security Risks in Ungoverned, Semi-Governed, and Differently-Governed Spaces
Topic 4: Analysis of Foreign Influence Operations in Cross-Cultural Perspective
Topic 5: Community Studies on Online and Offline Influence
Topic 6: Computational Social Science Research on Difficult-to-Access Environments
Topic 7: Social and Cultural Implications of Artificial Intelligence
Topic 8: Humans and Outer Space
Topic 9: Management and Information in the Defense Environment

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Topic 1: Social Implications of Environmental Change
POC: David Montgomery, OUSD-R&E, Basic Research Office, david.w.montgomery61.civ@mail.mil

There is strong scientific consensus that climate and environmental changes across the earth's ecosystems will result in ever-increasing uncertainty, surprise, and undesired outcomes. Understanding the convergent dynamics of human behaviors, environmental changes, and their social implications is critical. Current and future security threats associated with climate change, for example, can be hard to anticipate because productive models must capture the deep interdependence and cascading risks of both earth system stressors—climate, water, food, etc.—and also economics, political regimes, and health systems/disease outbreaks that can be conceptualized differently by different cultural systems. Thus, there is a strong need to develop precise, data-driven future scenarios within the contexts of social science as they apply to catastrophes, particularly variables that involve discontinuous, variable, and/or exponentially accelerating events. Accepting climate and environmental change as a national security challenge, this topic seeks to explore the multifaceted social implications of environmental change. The focus here is not on questions of *if* climate change causes conflict, but rather how stresses to various earth systems—such as climate change, land-system change, freshwater and ocean stress, etc.—impact social behavior, governance, fragility, and stability, and vice versa. As migration and population movement are likely to continue on varying scales, questions about the absorptive capacity concomitant with the tensions of social integration and acceptability are likely to be relevant. Of central emphasis should be how shifts in ecological systems impact people locally—across micro-, meso-, and macro-levels—and how this shifts social dynamics, with data being disaggregated by gender, income, status within society, and other locally-relevant indicators of the experience of the changing environment.

Specific foci may include, but are not limited to:
- How the (biophysical) environment interacts with other factors (e.g. policies, social norms, perceptions) to influence migration decisions and the consequent social, political, and economic dynamics, including challenges of integrating increased cultural diversity in receiving countries and strain on natural resources;
- Objective challenges of social integration (e.g., beyond demeaning one group in face of another) and variables that determine success or conflict; what are the limits of dominant global frameworks to adapting to these tensions brought through diversity and difference;
- How environmental transitions impact population growth, distribution, and gender dynamics, and how such shifts impact local dynamics; e.g. how do countries, governments, institutions, and extremist organizations adapt to such stressors;
- The implications of various types of environmental change on the ability of both state and non-state groups to organize, mobilize, strategize, govern, etc., considering the geographic areas or pathways where the cumulative effects over time lead to growing grievances that may subsequently lead communities to take action in some form;
- The social implications of unevenly distributed environmental impact—e.g. sea level rise, fresh water availability, changes in fisheries, agricultural viability, etc.—exacerbates shifting opportunities and challenges of cultural tensions across the *status quo*;
- Designing multi-disciplinary approaches to forecasting that bridge ecological and sociological/anthropological analysis of local problems relative to local, national, regional, and/or global tipping points. This should include the correlation of data from plausible, downscaled climate model outcomes—abrupt "shocks" as well as slower system changes—with local dynamics of stability and social disruption, alongside an appreciation of great power and other levels of competition perspectives on the salient problems, threats, needs, and opportunities;
- How ecological and social change interacts with the emergence and spread of new infectious diseases, epidemics, and more contagious variants—such as urban encroachment that increases interaction with wild species and the chance for zoonotic transmission—and how such threats

impact social relations and cohesion, focusing on the potential security impacts of such social shifts;
- How to think more creatively, collaboratively, and holistically to influence social behavior and resilience aimed at addressing the challenges posed by earth system stressors that are experienced with uneven urgency and understood and perceived through culturally diverse frames. This includes how beliefs about environmental causes change group identity; how global environmental changes may affect rules-based international systems; and how institutions and their structures may respond and adapt to the challenges associated with environmental change.

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Topic 2: Resource Competition, Social Cohesion, and Strategic Climate Resilience
POC: David Montgomery, OUSD-R&E, Basic Research Office, david.w.montgomery61.civ@mail.mil

Climate and environmental change is a defining global challenge with significant potential to reshape future security and stability, including but not limited to mass migration, fragility, infectious disease, water scarcity, famine, energy challenges, as well as new opportunities. As such, it presents both global systemic risk to local and national social structures and a broader threat of societal rupture instigated by both slow- and rapid-onset climate events and shifts in the types and availability of critical resources. Understanding the plurality of local-scale perceptions, the social construction of belonging, and group cohesion alongside the interconnectedness and adaptability of complex societies will be central to understanding the possibilities of varying institutional structures to adapt to likely future scenarios. Key to this will be not only novel ways of analyzing the problem but a fundamental approach to appreciating the socio-geopolitical impact of solutions aimed at adapting, mitigating, and preparing for such scenarios, many of which are unfolding before us. In many respects, this represents a problem of system complexity wherein second- and third-order causes need to be appreciated to understand impacts and opportunities. Thus, in considering climate resilience, attention should be given to understanding what differentiates resilient communities and countries from those that are less resilient, and empirically-identifying both formal and informal strategic adaptation strategies.

Specific foci may include, but are not limited to:
- Quantifying and identifying the impacts on group solidarity and social cohesion brought about by events of environmental change—including economic, political, health, etc.—that demonstrate an appropriately nuanced social theory of group dynamics at different scales. Related to this, how are non-Western theoretical frames used to explain social behavior and what are the implications of economic disparity and unevenly distributed opportunity?;
- How do dynamics around local provisioning and regulation of ecosystem services, resource access, and livelihood security affect stabilization campaigns, and how might such dynamics evolve under different types of influence or information (patterns)?;
- What is the range of ways that peer and near-peer adversaries manipulate environmental conditions and messaging to their strategic, operational, and tactical advantage?; How might institutional structures—including those of great powers, other levels of competition, and international cooperative organizations—respond to social, economic, and environmental stress and what are the likely cultural, political, and world-order implications posed by different approaches and tensions between the need for multilateral cooperation in the face of growing discontent with globalization;
- How does perceived or realized resource competition influence thinking about escalation and deterrence, and how does climate change portend to reshape great power and other levels of competition around the availability of resources?;

- How does economic interdependence and the role of alliances in burden-sharing help or hinder the management of environmental challenges; this includes a typology of environmental change impacts at different scales—including resource scarcity (current and future) and disease events—on economic sectors, vital supply chains, and how both circular and integrated economies are potentially impacted by the social and political responses to local environmental change; How do we build strategic climate resilience and understand empirically when we are doing so (effectively or less effectively)?;
- How should we understand cumulative and cascading risks and the drivers of mega security emergencies and how do we establish metrics of success in order to determine the most appropriate adaptive strategies in the short-, medium-, and long-term? Which sub-indicators of adaptive capacity and resilience give governments the greatest return on their investment?; which would be most impactful and longest lasting?;
- How does geography and population density influence how the problems are conceptualized and how might rapid shifts in societal perceptions of climate change influence political action and affect decisions about investments in resilience?

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Topic 3: Security Risks in Ungoverned, Semi-Governed, and Differently-Governed Spaces
POC: David Montgomery, OUSD-R&E, Basic Research Office, david.w.montgomery61.civ@mail.mil

This topic aims to support research to understand topical areas related to quantifying and describing vulnerabilities to sociopolitical instabilities in physically and virtually contested spaces that lack strong governance infrastructures and to understand the dynamics of great power and other levels of competition in influencing these spaces. The emphasis is on building scientific understanding about how these ungoverned / semi-governed / differently-governed spaces evolve, the behavioral norms and social reinforcement that sustain them, and the consequences for the nation and world from a cross-national perspective. How does competition for control over these spaces affect the global balance of power? There are three domain spaces of particular interest: (1) Regions undergoing transitions in governance (e.g., areas of the Middle East, Africa, Eurasia); (2) Spaces subject to rapidly evolving and varying degrees of international conflict and governance (e.g., cyberspace); and (3) Areas in which international laws are undergoing shifts (e.g., outer space, polar regions, deep sea, and international waters.) These diverse types of domains represent contested or potentially contested regions in which social structures, particularly governance (both formal and informal) and political structures, are increasingly unpredictable and pose security risks. Many of these contested regions are repositories for high-demand, valuable resources, and social control implies resource control. Additionally, technology has facilitated more complex (emergent) access to these semi-governed domains. For example, outer space, cyberspace, polar regions, and deep sea areas are all dominated by informal structures and perceptions of control yet are characterized by a lack of comprehensive formal law and universally agreed-upon governance structures. This topic also seeks insight on how different nation states are formulating policy and governance structures related to these ungoverned / semi-governed / differently-governed spaces and how governance performs following acute perturbations such as crises.

These spaces pose substantial risks of illicit activity, international conflict, violence, and threats to national security and global social order, and thus this topic seeks to better understand the dynamics of fluid or shifting governance and their implications in a wide range of other types of similar spaces (i.e., geographical, technical, environmental). Additional foci include considerations such as: How do state and non-state actors organize to control regions of limited formal governance? What are the dynamics between informal and formal governance? What variables are more or less functional in determining resource control and how they are exerted? What are the implications for surrounding territories? Can

related national security risks be identified? Specifically, data and experience in a variety of geographic regions should be leveraged to apply similar and divergent variables and processes. Mixed-method approaches that integrate qualitative and quantitative analytic strategies are encouraged, as are multi-disciplinary theoretical approaches that facilitate the development of causal models and robust validation methods.

Specific foci may include, but are not limited to:
- Evolving sociopolitical and economic structures in currently contested geographic regions (including for example regions of the Middle East, Africa, Eurasia), especially those looked at comparatively and across different scales;
- Effects on control of these spaces on the global balance of power;
- Balance between state and non-state actors as well as formal and informal social and normative controls;
- Resource control (e.g., mineral, natural, technological) in contested regions on earth or in outer space;
- Emerging governance structures and markets in ungoverned / semi-governed / differently-governed spaces, especially those approaching questions of managing the commons in novel ways;
- The management of data rights, especially the challenge of the uneven governance of data where different countries apply different value systems in managing data;
- What potential economic opportunities inform future changes in the relative value of different types of engagements and how might opportunities cause changes in coalition partners as well as evolving sources of instability?

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Topic 4: Analysis of Foreign Influence Operations in Cross-Cultural Perspective
POC: Rebecca Goolsby, Office of Naval Research, rebecca.goolsby@navy.mil

Over the past decade, several dominant Asian nations have accelerated efforts to extend their spheres of influence globally. The strategic approach in these efforts has varied across targeted geopolitical regions and time. Research has lagged in studying important strategic regions in Asia, Africa, and Latin America. A successful proposal will include only one of these regions, and no more than three nations within that region, in order to get to the desired depth of study. The topic seeks multidisciplinary theoretically innovative approaches from disciplines such as anthropology, cross-cultural sociology, political science, political economy, and cross-cultural social psychology, working in collaboration with computer and information sciences to develop a social science-forward approach to the development of social theory and the creation of new techniques needed to carry out a systemic analysis of social influence in online and offline cross-cultural milieus, cyber-social dynamics, narrative, and in languages other than English. Real-world influence efforts should also be studied along with cyber-social efforts, to better illuminate how real-world and cyber-world efforts converge, cohere, and amplify one another. The development of useful metrics of impact on single and multiple platforms is also a desired deliverable from this research. An important aim of this project will be to better understand the motivations and strategies of international influence campaigns on target states and the development of new approaches to counter these efforts, including proactive and reactive strategies by the U.S. and her allies for messaging activities and other cyber-social efforts, as well as economic and other real-world approaches to (counter) influence.

Successful proposals will demonstrate expertise in the nations chosen for study, including language competence, and will indicate their impact with reference to U.S strategic concerns. The analysis will be

restricted to non-classified sources, including scholarly publications, media outlets, interviews with local actors, and where possible, ethnographically-grounded qualitative work in the targeting and targeted states. International partnerships are acceptable and encouraged.

A number of specific questions and issues are of interest. These are not mutually exclusive and they certainly are not exhaustive. They include the following:

- What are the broad goals driving the dominant state's efforts in extending its sphere of influence? What are the strong motivating factors, beliefs, and values that drive the influencing state's posture relative to the targeted state? How do these affect their approach?
- What are the mechanisms of influence that to date have been exploited by the influencing state, with respect to the targeted state, including any differences in the targeting of economic, military, cultural, and political sectors?
- What factors affect the success of the influencing state in these cyber-social and real-world operations? How do real-world and cyber-social operations converge, cohere, or backstop one another?
- How successful have the U.S. and her allies been, proactively or retroactively, in countering or promoting these influence operation in the last five years? What were the strengths and weaknesses of these efforts during that period? Where can the U.S. rapidly and definitively improve in countering and diminishing these influence operations?
- How does cyber-social influence of influencing states impact the stances and opinions of elite decision-makers? How does cyber-social influence impact local communities in their relationship with the influencing state? In their relationship with their own states? In their relationships with other communities within the state?

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Topic 5: Community Studies on Online and Offline Influence
POC: Rebecca Goolsby, Office of Naval Research, rebecca.goolsby@navy.mil

In social science, community is understood as a social unit with perceived commonalities such as a shared sense of culture, norms, values, religion, status, identity, etc. This may lead individuals to work together to organize social life within a particular space and it may bind people together by a sense of belonging sustained across time and space. Those bounded by a particular space are sometimes called "local communities" or "real-world communities," yet with increased global mobility, emerging forms of information transmission, and a heightened polarization of ideas, questions of what holds groups together—both locally and translocally—appears under stress. Today, as novel forms of social groupings evolve around social-cyber mediums of exchange, questions emerge about the online and offline influence on group affinity, identity, and affiliation, and how this impacts both human and national security.

While there is a vast literature on community and society, how communities are formed and get (re)imagined, and the evolving and sociologically transformative role media plays in shaping social interaction, this topic is interested in the contemporary nature of "local" community—including traditional and "modern" conceptions—and what binds it across different cultural milieus—both rural and urban—and the cyber-social influence carried out online and offline. The formation of new identities and stances may be hidden—such as with some ethnic nationalist or other extremist identities— or overt, depending on the kinds and types of (local) social support. When these new identities and stances become public and operationalized, communities often face significant threats to civil order and to the ability to develop consensus to local concerns, especially as related to managing the commons. Local communities,

after all, are critical to understanding the real-world expressions of influence and subsequently serve as markers for stability across micro-, meso-, and macro-scales.

This solicitation expects proposals to involve social scientists, media researchers, area specialists (as appropriate) working with information and/or scientists to develop their approaches. Ethnographic work, real-world surveys, expert interviews, focus groups, and experiments may be used together with computational work in the measurement and characterization of online communities and their impact on the real-world. A successful proposal should combine the real-world study of human behavior with the study of cyber behavior in a diversity of local social contexts, investigating how social media engagement and participation in new (imagined) social worlds result in the formation of different identities, beliefs, and behaviors that have significant implications for social stability within different systems of governance. Successful proposals will (1) study local community and social-cyber community to improve understanding of "hard influence"—influence that promotes the development of fissures in society, such as the promotion of hate, group polarization, public health disinformation, and conspiracy theory; (2) consider the role of real-world communities and social-cyber community counterparts in "soft influence"—constructive, positive narratives, and social rewards that aim to create cohesive, well-functioning communities; (3) explore the online and offline social-cyber implications on group formation in different cultural contexts; and (4) look at how social-cyber space shapes conceptions of individual prioritization and group cohesion as it relates to local stability, security, and the social contract (across different cultural and political contexts).

Specific foci may include, but are not limited to:

- How does/can real-world community temper and constrain the at-times destructive and anti-social aspects of social-cyber influence?
- How important are cyber-social relationships—such as parasocial relationships with influencers—in escalating individuals toward performative or violent extremism?
- What can communities do to preserve civility, social cohesion, and social functionality, at local, regional, and national levels? What combinations of solutions need to be enacted in the real-world communities to improve civility, social cohesion, and counter "hard" influence?
- Are there methods or algorithms that platforms could or should use to prevent the creation of toxic and viral techniques as applied to conspiracy and rumor propagation and disinformation? What combination of solutions needs to be advanced to help responsible cyber-communities and individuals fight disinformation and other influence techniques intended to promote group polarization and shape the platform's social dynamics to viralize hard influence content?
- What is the role of news agencies, legitimate and less legitimate, in viralizing disinformation and group polarization? What measures could be taken to reduce their role in the amplification of disinformation, rumor, and group polarization?
- How can "hard influence" and "soft influence" be measured in online communities? How can attempts to counter hard influence be measured in terms of impact? What metrics can be achieved in the online community that describe, predict, or characterize its potential impact in local community settings? How can survey or focus groups be used to measure the impact of online worldviews on the worldview of local community members and groups?

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Topic 6: Computational Social Science Research on Difficult-to-Access Environments

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

With the exponential increase in available data, computational social science has emerged as a field with the potential to transform understandings of the social world. For computational social science to reach it's potential in helping address real-world problems, new collaborative public-private arrangements, data infrastructures, and university organizational challenges must be addressed, alongside measured consideration of the social, ethical, and legal factors across societies with different cultural, ethical, and institutional norms. One challenge of any heavily quantitative approach, however, is to assure that it is qualitatively grounded and ethnographically representative of the diverse lived environment under consideration. Of particular interest for this topic is the use of computational social science to enhance research understandings of difficult-to-access environments—ranging from enduring conflicts to societies that broadly restrict researcher access—where qualitative work can be more difficult. Proposals are encouraged to consider new models of collaboration, innovative experimental design and data analysis, and explore novel relationships between theory and experiment. It is expected that validation strategies will draw upon available qualitative data, but may also include experiments that specifically target gaps in our understanding.

Specific foci may include, but are not limited to:
- How to understand community diversity and the sociocultural impacts of repressive regimes on diverse populations; i.e. how to know what is happening on the ground when on-the-ground research is not possible;
- How to understand socioeconomic complexity related to problems of inference, such as geopolitical intent, emerging technology development, and novel capabilities;
- How to disaggregate social and behavioral complexity to better understand individuals, groups, networks, and societies in relation to stability and commitments of belonging;
- How to understand digital civil society; digital self-governance; the effects of e-governance; mistrust of the state and the implications of fractured governance at various levels; and the provision of public goods in traditional and non-traditional ways;
- How to apply computational social science methods across different epistemological approaches.

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Topic 7: Social and Cultural Implications of Artificial Intelligence
POC: Laura Steckman, Air Force Office of Scientific Research, laura.steckman.1@us.af.mil

Artificial intelligence (AI) and related technologies, such as machine learning, offer both promises and challenges to resolving some of the world's most complex problems. Numerous international leaders have indicated that the nation that can best harness AI and AI-enhanced capabilities will wield great power and have the global advantage. Regardless of whether possessing AI capabilities equates with power, the world finds itself in a race to develop and deploy these technologies; over thirty nations now have national AI strategies published or drafted in addition to a growing number of bilateral, multilateral, and other international AI roadmaps. As part of this race, people, companies, and governments around the world are testing algorithms and systems for purposes ranging from the prosocial to profit. As many of these technologies go online, their reach may not be contained to a specific population or locality, either purposefully or unintentionally, nor will they be constrained by social or political borders. The implications of AI and technologies that spill over to unexpected people, places, and societal sectors raise fundamental questions about those technologies and the effects or changes they may create.

During the history of AI, the science and research have been subject to long-standing critiques from cultural and philosophical lenses. The converse approach, however, understanding how culture,

philosophy, and ideology directly shape AI development from planning to execution, to include how those practices shape the technology's [un]intended effect(s) on populations or places that may not be co-located with the developers, has received little inquiry. While there is some agreement, particularly from humanistic and other social disciplines, that AI and similar technologies are themselves part of a larger socio-cultural endeavor wherein the people who develop them come from social traditions that influence their approach, the specifics of how those social—as well as cultural and ideological—experiences affect technology conceptualization, development, and deployed effects is not well understood. This topic seeks to support research that uncovers and elucidates the role of cultural and social practices on the technological lifecycle and ultimately, whether and how AI and AI-enhanced capabilities affect end-user populations who may not be the technology's anticipated consumer base.

Empirical questions that the research should consider include inquiries into:
- To what extent do social and cultural practices become intertwined in the process of algorithmic and technology development?
- How do different ideologies, worldviews, or thinking styles inform technology development, and what impact do they have?
- How does local knowledge translate into AI and machine learning development? What is the relationship between local and global knowledge that may be encapsulated into emerging technologies, and what happens when they exhibit differences or contradictions?
- How does AI informed by specific social and cultural contexts affect people or systems in other cultural contexts? What are the implications, and which, if any, are more impactful than others?
- How do we understand the impact that a technology developed from a specific cultural standpoint has on peoples and groups with different worldviews? Do these impacts, if any, change in specific contexts, such as humanitarian assistance/disaster relief, security cooperation, or during times of local unrest?
- To what extent do social and cultural differences affect ethics and ethical considerations of AI and AI-enabled technologies? If they make an impact, what is it, and how do cross-cultural differences support and/or challenge the future of technology development and deployment?

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Topic 8: Humans and Outer Space
POC: Laura Steckman, Air Force Office of Scientific Research, laura.steckman.1@us.af.mil

The US revised its national space policy in December 2017 to reinvigorate its space program and, more specifically, to "lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities" from the Moon, Mars, and beyond. Achieving this vision requires significant preparation through prioritization and partnerships to plan for the technological, environmental, and human requirements of space exploration.

Missions in the space domain will require the development of new knowledge that considers the environmental, technological, informational, and human aspects involved with space missions separately and holistically. Space security will be paramount to ensure that the space domain remains stable, accessible, and peaceful. Different nations have announced various objectives for and in space, with some having short-term goals and others some more specific, long-term plans. For this reason, space will be a domain involving both cooperation and competition that may occur simultaneously or separately. Space management will require new processes and policies to address issues such as traffic, waste, and sustainability. It will also raise new questions about the allocation and labor of human-autonomous teams

in a dangerous, harsh environment; in addition, AI and robotics may play specific roles. The human dimension of space will involve psychological, cognitive, emotional, (neuro-) physiological, and social processes that may be altered, reinforced, or even disrupted to adapt to long-term exploration. For example, in addition to the physiological effects of microgravity, the sociocultural effects of remoteness, distance, disconnectedness, and [im]perceptions of time may play important roles in human performance and experience.

This topic seeks innovative, multidisciplinary research to inform preparations for future space travel and human expansion across the solar system with particular interest in research that considers the multilayered, multidimensional requirements for successful short- and long-term missions. Research projects must examine the human dimension at a minimum, with a preference for research that considers space's psychological, cognitive, and/or social human aspects and requirements with one or more other dimensions such as the sociopolitical, technological, environmental, and/or informational dimensions.

Research topics of interest include but are not limited to addressing:
- International space relations that consider how to balance security and competition with the [perceived] need for collaboration, trust, and transparency;
- Sustainability in space: what does it mean and entail? What processes and policies are required to build sustainable systems and systems of systems?;
- The concepts of remoteness and distance and the impact they may have on people, processes, and systems in space;
- Processes surrounding the development or evolution of cultural and social identity in diverse, remote, or isolated environments;
- Exploring similarities and differences, if any, that exist for autonomous systems, including human-machine teams, on Earth and in space;
- Sociocultural effects on human performance of the physical space environment and its associated social and physiological demands/implications.

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Topic 9: Management and Information in the Defense Environment
POC: David Montgomery, OUSD-R&E Basic Research Office, david.w.montgomery61.civ@mail.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 it's 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:

- 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?
- 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?
- 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 pair 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 best mitigate risk aversion in complex, bureaucratic organizations such as the DoD?
- 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.
- 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?
- 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 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;
- 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).