

Document Type: Special Notice

Contracting Office Address:

Department of the Army, Army Contracting Command, ACC-APG Research Triangle Park Division, 800 Park Office Drive, RTP NC 27709

Reference:

Broad Agency Announcement W911NF-23-S-0001-0004, US Army Combat Capabilities Development Command (DEVCOM) Army Research Laboratory Broad Agency Announcement for Foundational Research

PROGRAM TITLE: U.S. Army Combat Capabilities Development Command's (DEVCOM) Army Research Office (ARO) Historically Black Colleges and Universities (HBCUs) Centers of Excellence (COE) Research Program. Under the ARO HBCU COE Program, funding will be provided for HBCUs and Tribal Colleges and Universities (TCUs) to participate in highly collaborative research opportunities within the HBCU/TCU community with major DEVCOM ARO research programs.

ELIGIBILITY: This opportunity is only open to HBCUs and TCUs as provided in 10 U.S.C. § 4144, eligibility for this competition is open only to “covered educational institutions,” which are defined as:

- a. The term “eligible institution” means a Historically Black College or University or a Tribal College or University that is classified as such at the time of participation in the program.
- b. The term “Historically Black College or University” has the meaning given the term “part B institution” under section 322 of the Higher Education Act of 1965 (20 U.S.C. 1061).
- c. The term “Tribal College or University” has the meaning given the term in section 316(b) of the Higher Education Act of 1965 (20 U.S.C. 1059c(b)).

SYNOPSIS: This is a call for HBCUs/TCUs to submit whitepapers expressing its interest in participating in research opportunities with major ARO research program areas articulated in this announcement. This COE initiative will support innovative research and education at HBCUs and/or TCUs, and will be focused on areas of high Army interest that provides a basis for future technology innovation. These new COEs will conduct multidisciplinary, collaborative research that can increase knowledge in the areas of research emphasis specified in this announcement and have the potential to lead to practical application(s) for the Army. The topic areas described within this announcement are from ARO's Army Science Division.

The primary goals of the HBCU COE Program are to:

- Expand the research base through partnerships with Historically Black Colleges and Universities (HBCUs) and Tribal Colleges and Universities (TCUs).
- Encourage research and education collaborations with other institutions of higher education and defense organizations.
- Enhance research and engineering capabilities at HBCU/TCUs that align with Army research priorities in the fields of Chemistry, Materials, and Information Science related to long term national security needs.
- Provide opportunities for student participation leading to the next generation of scientists and engineers.

A whitepaper (and any subsequent invited proposal) should address scientific study and experimentation directed toward increasing fundamental knowledge and understanding in fields of Chemistry, Materials, and Information Science related to long-term national security needs, as described in this announcement.

An applicant is encouraged to consider innovative approaches for its research projects with a view toward enhancing the ability of their institution to develop stronger science and engineering programs that will enable the institution to participate more competitively in a variety of defense research programs and attract and retain good students by exposing them to state-of-the-art research, further encouraging them to pursue careers in STEM disciplines.

ARO will not prescribe the approach for a whitepaper or subsequent invited proposal; instead, it expects applicants to reflect the unique needs and capabilities of their institution and its partners. Methods through which program objectives can be achieved are varied. Factors such as research capabilities, facilities, and equipment are unique to each institution and should be considered when preparing a whitepaper or proposal. Whitepapers should address: a) what? -- describe what you hope to uncover, what evidence you have to support your claims, and the advancements it will provide compared to the current state of the art in science and/or engineering; (b) why? – why is your proposed research significant to the scientific or engineering field, and to the US Army; and, (c) how? -- how will you carry out your research (methods, processes, theoretical techniques, etc.) to reduce risk, increase your probability of success, and maximize return on investment for the US Army?

PROCESS: The application process to be considered for an award for the HBCU Outreach Program, consists of a Whitepaper stage and a Proposal stage. The purpose of requesting a Whitepaper is to minimize the effort associated with the production of a detailed proposal for those applicants that have little chance of being selected for funding. The Government's decision to invite a Proposal submission will be based upon the evaluation results of the timely Whitepaper submission. Only whitepapers of the highest merit will receive an invitation from the Government to submit a Proposal. An applicant that does

NOT receive an invitation from the Government to submit a Proposal is NOT eligible to submit a Proposal for the program and will not receive any feedback on its Whitepaper submission. An applicant invited to submit a Proposal may receive feedback on its Whitepaper prior to its Proposal submission. An Offeror that does NOT submit a timely Whitepaper, is NOT eligible to submit a Proposal for consideration for the award. The following describes the process to be used to make awards for the ARO HBCU COE Program:

1. Whitepapers are to be submitted to the ARO HBCU Outreach Program for each of the research areas described in this announcement. The format and content of the Whitepapers, as well as submission information, are described below. **Whitepapers may be submitted to more than one of the topic areas; however each topic area requires a separate submission.** Submissions should not exceed 6 pages (i.e., 1 cover sheet plus 5 content pages). A whitepaper submitted should align with Army research priorities and should address scientific study in the fields of chemistry, materials, and information sciences related to long term national security needs, specifically as described in this announcement. Each named Principal Investigator from an institution can submit only one whitepaper.

Full proposal submissions must be submitted in accordance with the preparation and submissions instructions under BAA W911NF-23-S-0001-0004, except as noted below. As a reminder, an applicant is not eligible to submit a proposal under the announcement unless its Whitepaper submission is timely, is highly rated, and the applicant is INVITED to submit a proposal. Proposals shall be submitted electronically through the www.grants.gov portal. A proposal sent by any other means (e.g., hand-carried, postal service mail, commercial carrier, fax or email) will not be considered. INVITED Proposals must be received no later than January 15, 2027 at 4:00 PM (EST) to be considered for award. The proposal content information is as specified under BAA W911NF-23-S-0001-2-0004, except the technical proposal (project description) portion of the full proposal must not exceed 15 pages. If the technical proposal exceeds 15 pages, only the first 15 pages will be reviewed and evaluated. As described in the BAA W911NF-23-S-0001-0004, the proposal must also include a budget for each year of support requested. Proposals will be evaluated using the criteria described below. Proposal evaluation is expected to be complete and any selections for award made by April 2027. An offeror whose proposal is selected for award will be contacted by a Grants Officer or Grants Specialist of the Army Contracting Command or by a representative of DEVCOM ARO.

To get full details on all ARO research priority areas, please see the most recent ARO Broad Agency Announcement (BAA) at <https://arl.devcom.army.mil/collaborate-with-us/>.

2. Whitepapers will be reviewed by Army Subject Matter Experts (SMEs) in each area of research described herein. Based on the evaluation results, the Government may invite, some, all, or none of the applicants that submitted timely whitepapers to submit full proposals. If the whitepaper is selected, the PI will be invited to submit a proposal. No

proposals will be accepted unless specifically requested by the agency. Support contractors may be involved in the reviews of the whitepapers and proposals. These support contractors are prohibited from submitting proposals under this BAA and are bound by non-disclosure and/or conflict of interest requirements as deemed appropriate.

3. Whitepapers and proposals will be reviewed based on the following evaluation criteria (in descending order of importance): a) the overall scientific and/or technical merits of the proposal; b) the potential contributions of the effort to the Army mission; and c) the qualifications, capabilities, and experience of the proposed PI, team leader, or other key personnel who are critical to achievement of the proposed objectives.

4. It is anticipated that 3 new Centers of Excellence will be established under this initiative, and more than one award may be made in a scientific area. Subawards are encouraged to enable collaboration and partnership to maximize the impact of the proposed research efforts.

SCHEDULE: The below dates are subject to change based on the number of whitepapers received and proposals invited.

7 October 2026: Whitepapers due (4 p.m. ET)

6 November 2026: Whitepaper evaluations complete

13 November 2026: Request for proposals

15 January 2027: Invited proposals due (4 p.m. ET)

April 2027: Award of grants to selected proposals

FUNDING: Funding for this program is anticipated to be approximately \$1.29 million per year, enough to support up to three (3) COEs funded at \$430K each year for five (5) years. Awards issued will be in the form of grants and only three (3) awards are anticipated across all six (6) research areas. Some research areas may receive no award and more than one award may be made in a research area. Up to 30% of the project each year may be used as a subaward to foster a collaborative research environment and enable connected, interdependent research efforts. For example, if the maximum amount of \$430K per year were awarded, then the total combined subaward allowed with another institute of higher education would be 30% of the total effort (\$129K of \$430K). The subaward is not required to be with another HBCU/TCU. However, any equipment purchased as part of this COE program must be installed and remain at the HBCU or TCU awarded the grant.

Faculty and/or post-doctoral associates as well as graduate research assistants at the applicant and partner institutions may participate in the project and assist the PI as co-PI or in another capacity. HBCUs/TCUs applying under this Special Funding Announcement may propose collaborations with up to one degree-granting Institution of Higher Education (IHE). Collaborations with entities other than degree-granting IHEs are not permitted. Any

proposed collaborations with IHEs should be explained in the narrative as well as the budget justification.

VERY IMPORTANT: There is no guarantee that any of the whitepapers submitted will be selected to submit a proposal or subsequently recommended for funding. The Government reserves the right to select for award all, some, or none of the proposals submitted in response to this announcement. All awards are contingent upon the availability of funds and COEs having met technical goals.

FORMAT AND CONTENT OF WHITEPAPER SUBMISSION: Submissions should not exceed 6 pages (1 cover sheet plus 5 content pages). Included in the 6-page submission should be a 3-page Project Summary/Abstract that should provide a concise description of the research/collaboration to be conducted, the institution(s), and technical area under which the submission should be considered. An additional page should identify the PI and other key personnel, summarizing research credentials. A cover sheet and a final page should include a budget outline and justification. The budget outline should include costs for faculty and student support, proposed equipment purchases, training, travel, partner/subawards, and any other related costs.

The white paper should provide sufficient information on the research being proposed (e.g., hypothesis, theories, concepts, approaches, data measurements and analysis, etc.) to allow for an assessment by technical experts. It is not necessary for white papers to carry official institutional signatures.

Funding Restrictions:

- Submissions may not request funds for, and awards under this Special Funding Announcement, may not be used for, the construction or modification of buildings or building support systems (e.g., heating/ventilation/air conditioning, and distinguished from specific installation requirements for the equipment/instrumentation proposed; raising the ceiling of a building, moving HVAC systems and/or re-routing associated ductwork) or purchase or installation of fixed equipment (e.g., clean rooms and fume hoods).
- Submissions may not request funds for, and awards under this Special Funding Announcement may not be used for operation and maintenance, including extended warranties, user fees and maintenance agreements.

Additional Submission Information:

Preliminary Inquiries: ARO receives a high volume of whitepapers and proposals annually and anticipates receiving a high volume in response to this announcement. Because of financial constraints, and as noted above, we are able to provide support for only a limited number of the proposals received. We realize the preparation of a research proposal often represents a substantial investment of time and effort by the applicant. Therefore, in an attempt to minimize this burden, we strongly encourage applicants interested in

submitting whitepapers to this HBCU COE Program to make preliminary inquiries as to the general need for the type of research effort contemplated, before expending extensive effort in preparing a whitepaper and/or detailed proposal or submitting proprietary information.

Preliminary inquiries should be directed to the Technical Points of Contact outlined in the Topic Areas of Interest listed below.

Questions regarding program execution and administration should be directed to: Mr. Justin Smith at justin.r.smith191.civ@army.mil.

NOTE: The Government will not be obligated by any discussion that arises out of preliminary inquiries.

WHITEPAPER SUBMISSION INFORMATION: Whitepaper submissions must be received by 4:00 p.m. Eastern Standard Time, Wednesday, 7 October 2026. Whitepaper submissions are due to the ARO HBCU Outreach Program at the following e-mail address: usarmy.rtp.devcom-arl.mbx.hbcu-mi-programs@army.mil.

VERY IMPORTANT: Applicants are responsible for submitting its whitepaper in sufficient time to avoid the possibility of late receipt (for any reason, including technical difficulties). Submissions received after the deadline will be deemed ineligible and no further consideration will be given to them.

The Government will acknowledge receipt of each Whitepaper submission via a return email to the submitter. Once the decision has been made as to which Whitepapers will be invited for a full proposal submission, the submitter will be informed that either: (1) the Whitepaper has been selected for a full proposal submission; or (2) the Whitepaper submission is not being considered further in connection with the ARO HBCU COE program. Finally, submitters whose whitepapers are selected for a full proposal will be notified if the proposal is funded or not, after the proposal is submitted, evaluated, and final funding decisions made. No further feedback concerning Whitepaper submissions will be provided to submitters beyond what is described herein.

Whitepapers must be in the following format, but do not require any special forms:

- a. Page Size: 8 ½ x 11 inches
- b. Margins – 1 inch
- c. Spacing – single
- d. Font – Arial (or equivalent), 12-point
- e. Combine all files and forms into a single PDF before submitting.

The whitepaper cover page shall include at a minimum: Title of the whitepaper, name of the individual and organization submitting the whitepaper, the research area from the COE

funding announcement against which the whitepaper is submitted, and the Technical Point of Contact listed in the topic area.

Applicants shall indicate any Government coordination that may be required for obtaining equipment or facilities necessary to perform any simulations or exercises that would demonstrate the proposed capability.

The cost portion of the whitepaper shall contain a brief cost estimate revealing all the component parts of the proposal, including research hours, burden, material costs, travel, etc.

- **Travel:** Forecasts of travel expenditures (domestic only allowed) that identify the destination and the various cost elements (airfare, mileage, per diem rates, etc.) must be submitted, if a proposal is requested. The costs should be in sufficient detail to determine the reasonableness of such costs. Allowance for air travel normally will not exceed the cost of round-trip, economy air accommodations. Specify the type of travel and its relationship to the research project. Foreign travel (i.e., travel outside the continental U.S., its possessions and Canada) is not allowed. Special justification will be required for travel by individuals other than the PI(s). Individuals other than the PI(s) are considered postdoctoral associates, research associates, graduate and undergraduate students, secretarial, clerical, and other technical personnel.
- Additional travel may be requested for travel to Army laboratories and facilities to enhance agreement objectives and to achieve technology transfer.
- **Participant Support Costs:** This budget category refers to costs of transportation, per diem, stipends, and other related costs for participants or trainees (but not employees) in connection with conferences, meetings, symposia, training activities, apprenticeships and workshops. The number of participants to be supported should be entered in the parentheses on the budget form. These costs should also be justified in the budget justification page(s) attached to the cost proposal.
- **Materials, Supplies, and Consumables:** A general description and total estimated cost of supplies are required. The basis for developing the cost estimate (vendor quotes, invoice prices, engineering estimate, purchase order history, etc.) must be included. If possible, provide a material list if invited to submit a full proposal.
- **Publication, Documentation, and Dissemination:** The budget may request funds for the costs of preparing, publishing, or otherwise making available to others the findings and products of the work conducted under an agreement, including costs of reports, reprints, page charges, or other journal costs (except costs for prior or early publication); necessary illustrations, cleanup, documentation, storage, and indexing of data and databases; and development, documentation, and debugging of software.
- **Computer Services:** The cost of computer services, including computer-based retrieval of scientific, technical, and educational information, may be requested. A

justification/explanation based on the established computer service rates at the proposing organization should be included. The budget also may request costs, which must be shown to be reasonable, for leasing automatic data processing.

- The purchase of computers or associated hardware and software should be requested as items of equipment.

ARMY RESEARCH RISK ASSESSMENT:

Each proposal recommended for funding in accordance with II.E.2.c in the DEVCOM ARL BAA, whose costs have been determined to be reasonable and realistic in accordance with II.E.2.d in the DEVCOM ARL BAA, and for which funds are available, will be subject to an Army Research Risk Assessment (ARRA) prior to award. The ARRA process is described fully in the DEVCOM ARL BAA. More information on the Army Research Risk Protection Program (ARRP) can be found on the following web site:

<https://www.arl.army.mil/collaborate-with-us/opportunity/arrp/>.

DESCRIPTION OF RESEARCH TOPIC AREAS:

Research Area #1 - Embodied Intelligence for Enhanced Human-Machine Interaction: Conventional approaches to autonomous control via artificial intelligence or reinforcement learning overlook the profound impact of the body's interactions with the environment on cognitive processes. Embodied intelligence (EI) emphasizes the distributed nature of cognition, incorporating the body's sensory experiences and physical engagements. EI is well-observed in locomoting and manipulating systems that can reject environmental perturbation by leveraging morphology – largely avoiding recruitment of slower, more powerful central controllers. Understanding how these external factors (environment/body) contribute to the development of intelligent behaviors is crucial for creating more adaptive and context-aware autonomy. The objective of this research is to explore the neural and physiological mechanisms underlying embodied cognition in order to develop systems that enhance human-machine interaction, leading to more adaptive, context-aware autonomous agents. This topic also seeks qualitative notions and quantitative definitions of optimality, adequacy, and adaptability. Successful applicants will identify phenomena, counterintuitive observations, or emergent patterns in adaptive behavior of autonomous systems and/or organisms featuring hierarchical and/or distributed control that leverages EI, and construct validation plans for bold hypotheses that offer causal intuition into the quantifiable role EI plays in this adaptability. This research falls under the topic ARL-BAA-0018, Complex Dynamics and Systems.

POC: Dr. Dean Culver, dean.r.culver.civ@army.mil, (240) 541-1436

Research Area #2 - Active Matter Under Extreme Conditions: The future Army will increasingly rely on materials and technologies that are multi-functional and dynamically reconfigurable. Such reconfigurable materials are expected to play a major role in next generation sensors, signature management, protection, targeting, and other technologies

that will allow the Soldier to adapt to changing battlefield requirements and circumstances in real-time. Non-equilibrium self-assembly—known also as dynamic or dissipative self-assembly—is emerging as a rational way to create active matter-based materials that are intrinsically dynamic, adaptive, and reconfigurable. Much like living systems, these self-assembling active matter systems can adopt various configurations when subject to one or more external driving forces. These driving forces can be optical, vibrational, thermal, acoustic, electrical, magnetic, chemical, etc. (or multiple combined drives, spatially or temporally varying drives, etc.) and induce the system to adopt a particular ordered, pseudo-ordered, or disordered state for as long as the external drive is applied. Each non-equilibrium state of the system can exhibit extraordinary properties with respect to the propagation of Army-relevant wavelike phenomena, including light, sound, and heat. Despite the promise of these materials, current research is largely phenomenological, and a full understanding of the interplay between the nature of the external drive(s), many-body interactions within the active material, the myriad possible end states, and the resulting physical properties is still lacking. Moreover, a highly relevant and recently emerging research theme—active self-assembly under “extreme” conditions and driving forces (such as, but not limited to, turbulence, high/low gravity, high/low pressures or densities, rotational fields, etc.)—offers even greater possibilities to realize novel behaviors in active matter, but understanding and control are still nascent. Concerted and integrated theory, computation, and experimental efforts are still needed to develop general design rules for non-equilibrium self-assembling active matter, including active matter systems under extreme driving forces or otherwise subjected to extreme environments. This solicitation seeks novel ideas for designing and realizing active self-assembling systems that adopt multiple dynamically accessible non-equilibrium states by dissipating energy from a variable external drive, and to explore how these systems behave under extreme conditions. Changes in configuration should be accompanied by dramatic changes in the physical properties of the material (e.g., an optical, vibrational, or acoustic band gap). Theory-based computer simulations and data-driven tools like machine learning should be a primary driver towards extracting general design rules for active matter, deriving causal relationships between driving forces and assembly pathways, and prescribing deterministic methods to control assembly. Complementary experiments should be used to confirm theoretical predictions and refine the design rules. This research falls under the topic ARL-BAA-0012, Materials Design.

POC: Dr. Evan Runnerstrom, evan.l.runnerstrom.civ@army.mil, 919-549-4259

Research Area #3 - DETECT, DETER, AND DEFEAT ARTIFICIAL INTELLIGENCE INSIDER THREATS: This Center of Excellence will build the fundamental science to understand the emerging vulnerability of artificial intelligence (AI) as an insider threat, with focus on understanding how to detect (indicators), deter (resilient technology), and defeat (mitigation) against compromised AI and the impact on social and organizational concurrent systems.

The U.S. Army recognizes AI as a transformational technology that will decide future wars and is rapidly integrating AI into every aspect to include human-machine integrated formations, autonomous systems, and computer agents to support C2 (command and control) decision-making. To date, current research and development efforts primarily focus on overcoming known limitations (e.g., routine vs. dynamic situations) and issues (e.g., processing biases, response hallucinations) leading to scientific and technological breakthroughs (e.g., neuromorphic computing, deep language models). These advancements bring human-based capabilities such as [short- and long-term] memory and advanced sentiment analysis to AI, increasing its capacity to understand and engage humans, but also a new vulnerability once unique to humans, that of insider threat. Transformation from “friend” to “threat” could be human driven (e.g., adversary manipulates data and/or other features to induces anti-U.S. sentiment, biases, etc. within the AI), self-directed (e.g., AI develops its own anti-U.S. perceptions, biases, etc. over time from continuous information processing of data repositories), or from another AI (e.g., co-development of U.S. opposition through shared information processing and reinforcement).

It should not be assumed that traditional approaches and practices (e.g., cybersecurity, OPSEC) will be effective against this new emergent threat particularly as organizations employ AI for activities beyond human capabilities (e.g., information processing of large data sets) and increasingly rely on AI to monitor other AI and systems. Instead, new sophisticated approaches that draw inspiration from human-based frameworks, models, and case studies will need to be developed, validated, and dynamically updated. Importantly, these approaches need to support real-time updates to keep pace with the rapid innovation and advancements of AI capabilities while maintaining congruence with organizational priorities, strategies, and dynamics.

A successful Center of Excellence will take a transdisciplinary approach to understand AI insider threat to develop scalable and updatable frameworks, models, and other products through the collaboration of experts in, but not exclusively, artificial intelligence, complex systems, and social dynamics. This research falls under topic ARL-BAA-0102, Dynamical Influences on Social Systems, to understand the impact of emergent technology with increasingly human characteristics and capabilities on social systems and concurrent systems broadly over time and contexts.

POC: Dr. Greg Ruark, gregory.a.ruark.civ@army.mil, (240) 890-3591

Research Area #4 - Principles for Constructing Learning Enabled Systems: Some domains of decision making and action have high stakes: modern ground and air transportation, medical treatment, military conflicts. Complex systems in these domains work well through careful design of their concrete and abstract components: hardware, software, processes (manufacturing, training, operation), human knowledge (e.g., interpretation of sensor information) and when possible the environment (e.g., traffic signals). Engineering principles drive these designs, producing reliable, robust, trustworthy systems that degrade gracefully rather than catastrophically. Little of this is true about modern AI-based Learning Enabled Systems (LESs), in particular foundation models and their best-known

instances, large language models (LLMs). These models and other AI-based LESs are increasingly ubiquitous, yet practices for building larger cyber-physical systems containing learning-enabled, possibly non-deterministic components, is in early stages at best. When a system built on massive, black-box, monolithic models fails it is hard to explain why the system failed, and, importantly, it is hard to identify/isolate the component that needs to be fixed. System engineering practices are sought that would turn current practices from an art form to science. Important questions that need to be answered include: how do we test models and the systems that have been built around them? What metrics do we use to be sufficiently satisfied (in a statistical and logical sense) that a system meets expectations? How do we state expectations? What are models of good and bad behavior of LESs that incorporate AI models? How do we debug systems that have been built, when behavior doesn't match expectations? What mechanisms are necessary when composing components to ensure good behavior of composed LESs? How do we instrument large AI models and composed LESs under construction to debug (i.e., look under the hood) to identify faults?

There is now a long history of advances in Software Engineering practice that have now made it possible to share development responsibilities across the globe. This solicitation seeks work at the intersection of Formal Methods and Software Tools that would identify principles and provide scaffolding for building Integrated Development Environments (IDE) to curate data and models, debug specifications for models and composed cyber-physical systems, and derive efficient executable code that can be deployed, as well as research in principled model design and software development processes for building a robust and resilient code base. The objective is to develop LESs that can be confidently integrated into complex human processes, especially for high-stakes decisions. Because LESs (especially LLMs and foundation models) are being adopted for almost any task, an achievable suite of LES-evaluation tools is likely to have extremely broad impact. This research falls under topic ARL-BAA-0032, Advanced Learning-Enabled Cyber Physical Systems, which calls for proposals that spark innovation in theory, tools and techniques for building Learning Enabled Systems of the future.

POC: Dr. John Hyatt, john.s.hyatt11.civ@army.mil, (410) 306-0409

POC: Dr. Robert St.Amant, robert.a.stamant2.civ@army.mil, (240) 927-2060

Research Area #5 - Solid-State Energy Interfaces Center of Excellence: The future Army will increasingly rely on next-generation energy storage technologies that are lightweight, safe, and highly robust to power advanced soldier-worn devices, unmanned systems, and directed energy platforms. Solid-state batteries (SSBs) and supercapacitors have emerged as critical enablers due to their potential for high capacity and rapid discharge; however, the interplay between electrochemical processes and mechanical stress/strain remains poorly understood. Chemo-mechanical failures involving cracks, delamination, and interfacial degradation can be especially severe in tightly confined solid-state architectures where inorganic, metallic, and/or polymeric materials intersect. While researchers have made progress in understanding stress-catalysis relationships, fundamental knowledge gaps persist regarding how these stresses evolve during operation, how they influence chemical reactions at interfaces, and how they contribute to

dendrite growth or other high-voltage instabilities. Emerging strategies including advanced ceramic processing and self-healing interfaces offer promising avenues to mitigate these issues, yet a unifying framework for understanding and controlling interfacial chemo-mechanical properties remains elusive. This solicitation seeks novel concepts that elucidate and exploit chemo-mechanical interactions to realize safer, longer-lasting, high-energy-density devices. Of particular interest are new in situ and operando characterization methods that reveal chemo-mechanical degradation mechanisms, regenerative/dynamic interfacial chemistries, and next-generation ceramic or polymer materials which form a stable interface. Efforts must use fully dense ceramic or dry-processed polymer/ceramic composite electrolytes; liquid-filled separators will not be considered. Additionally, correlated experimental and computational approaches are encouraged, but purely computation efforts will not be considered. The intended outcomes are new materials, mechanisms, and models that catalyze disruptive solid-state energy storage technologies capable of delivering unprecedented performance and safety in future missions. This research falls under topic ARL-BAA-0025, Electrochemistry.

POC: Dr. Matthew Glasscott, Matthew.W.Glasscott.civ@Army.mil, 484-883-5095

Research Area #6 - Dynamic Response of Structures with Consideration Of Rapid and Concentrated Heating (DR SCORCH): Materials subjected to extreme dynamic events may experience a combination of high pressure/shear and subsequent thermal loading that make constitutive modeling and damage prediction very challenging. This basic research center of excellence will investigate the thermal effects associated with high strain rate (i.e. $> 10^4 \text{ s}^{-1}$) impacts of metals and ceramics. In particular, the center will focus on emerging experimental techniques for assessing high rate elastic-plastic response of materials near melting temperatures and/or in the presence of thermal gradients. Teams may include subscale experimental approaches, e.g. micron-to-millimeter scale, if there is a path to understanding relevance to full-scale material response. In addition, teams should include theoretical and computational approaches to understand microstructural influences on given thermomechanical behaviors. For example, how does grain size, crystal structure, dislocation density, etc. affect the thermomechanical response to high strain rate impact? What are the dominant defect mechanisms as a function of temperature for various structural metals and ceramics of interest to the Army/DoD? Are there opportunities to exploit material microstructure to manipulate the dynamic response of materials at high temperature? Insight into these phenomena may shape new DoD and civilian technologies, including Soldier and vehicle protection schemes, hypersonics, directed energy, novel materials synthesis and processing techniques, as well as geo- and planetary science applications. This research falls under topic ARL-BAA-0001 of the, Mechanical Behavior of Materials, which calls for understanding of extreme thermomechanical behaviors of structural materials.

POC: Dr. Dan Cole, daniel.p.cole.civ@army.mil, 919-549-4371

Questions should be directed to usarmy.rtp.devcom-arl.mbx.hbcu-mi-programs@army.mil. The deadline for questions related to the whitepaper: 1 October 2026

at 4 p.m. ET. The deadline for questions related to the proposal: 8 January 2026 at 4 p.m. ET. Any questions received after each deadline will not be answered.