Dr. Laurel Allender
Human Sciences Campaign
U.S. Army Research Laboratory

Human Sciences

Human Sciences is focused on identifying, creating, and transitioning the underlying scientific discoveries and technological innovations that are critical to the U.S. Army's future technological superiority

A Soldier traversing the SPEAR networked cross country course at Aberdeen Proving Ground

Winning in a Complex World

Understand and predict dynamic **HUMAN BEHAVIOR** of individuals, teams, organizations, and societies in real world situations

Directly and indirectly enhance individual **HUMAN CAPABILITIES** applicable to broad ranging scenarios

Discover, understand, exploit, and apply fundamental principles for the **INTEGRATION of HUMANS and SYSTEMS** across domains, including but not limited to complex information systems, human-agent teams, cybersecurity, and organizational and social networks

Human Sciences Taxonomy

Human Behavior

- KCI - Multi-faceted Assessment of Soldier Variability
- CCE – Real World Behavior

Human Capability Enhancement

- KCI – Training Effectiveness Research
- CCE – Training
- CCE – Augmentation

Integration of Humans and Systems

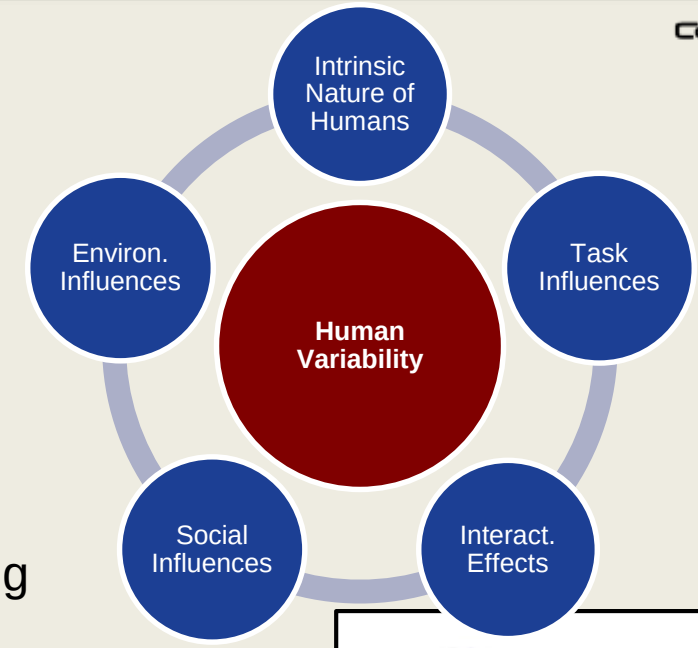
- KCI – Cybernetics: Strengthening Humans-Systems Coupling
- CCE – Humans in Multi-Agent Systems

KCI = Key Campaign Initiative
CCE = Core Campaign Enabler

Human Behavior: Human Variability

Vision:

Provide the foundation for future Army systems to adapt to the individual Soldier's states, behaviors, and intentions in real-time

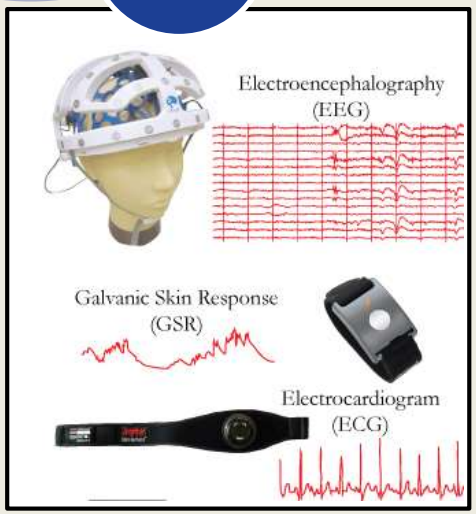


Impact and Relevance:

- Predict Soldier performance
- Provide fundamental enablers for enhancing Soldier capabilities
- Maximize Soldier performance beyond current capabilities

Technical Areas:

- Behavior, Psychological, and Physiological Characterization
- Integrative Biology
- Performance Prediction



McDowell et al (2013)
(ARL and Collaborators)

Human Behavior: Real World Behavior

Vision:

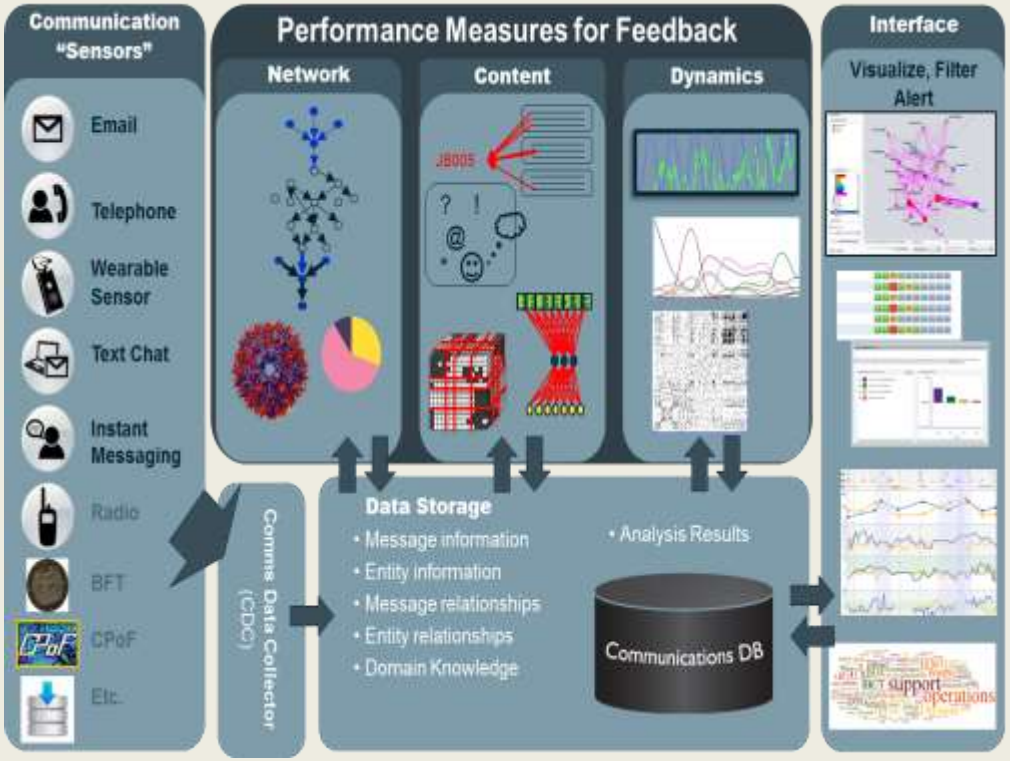
Understand human behavior within dynamic, complex, natural, military-relevant, or “real-world” contexts and environments

Impact and Relevance:

- Improve Soldier training
- Improve in-field performance
- Improve human’s use of technology

Technical Areas:

- Computational Human Sciences
- Social Network Analysis
- Quantitative Methods
- Team Dynamics



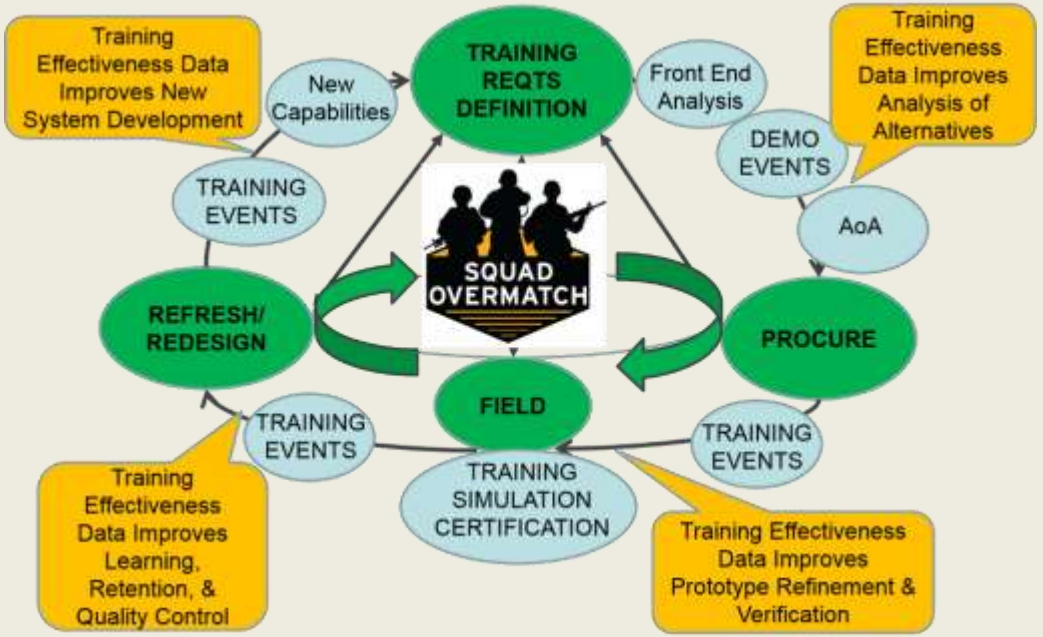
Human Capability Enhancement: Training

Vision:

Training technologies to enable real-time integration and adaptation to rapidly deployed technologies

Training Effectiveness

Measure and mechanisms for ensuring effectiveness at the point of instruction



Impact and Relevance:

- Ubiquitous, reconfigurable, fully adaptive, synthetic training environment
- Reduced time to attain job competency
- Increased rate of knowledge and skill retention
- Increased rate of training transfer for mission readiness

Technical Areas:

- Adaptive Tutoring
- Distributed Learning
- Training Effectiveness
- Virtual/Mixed and Augmented Reality

Human Capability Enhancement: Augmentation

Vision:

Augmentation to enable greater capabilities, provide resilience to durations of limited capabilities, and support agile, knowledgeable decision making

Technical Areas:

- Perception
- Cognition
- Physical

Impact and Relevance:

- Enable Soldiers to sense and perceive the environment faster, more accurately, and more comprehensively
- Enable Soldiers to move and act more quickly and decisively, while sustaining peak performance over longer periods

Soldier perception and physical performance can be impaired, protected, aided, or augmented by technology.

Integration of Humans and Systems: Strengthening Humans-Systems Coupling

Vision:

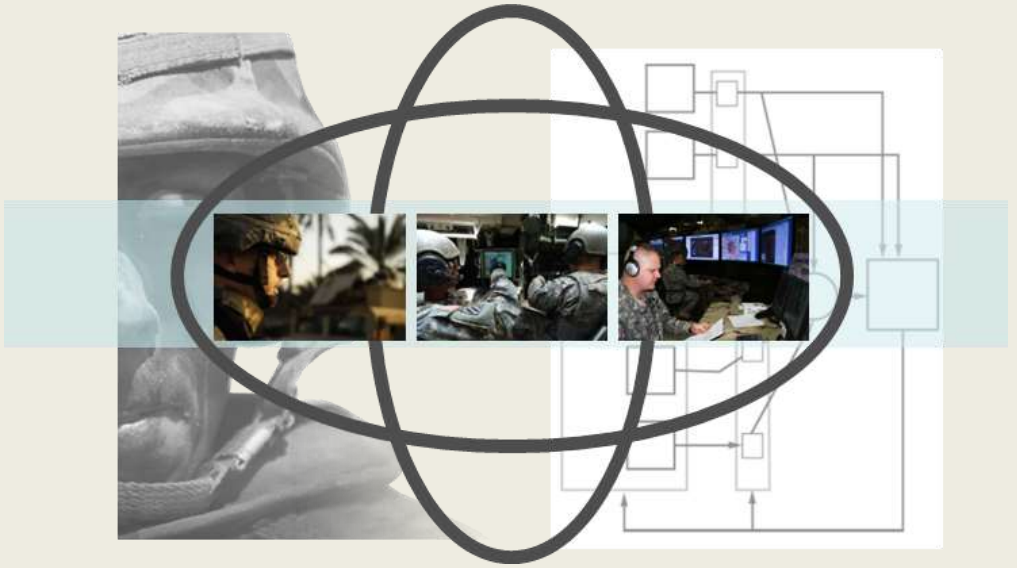
Effective, naturalistic, tightly coupled sociotechnical systems that are more adaptable to the dynamic user

Technical Areas:

- Multi-modal interfaces
- Intuitive and naturalistic interfaces
- Cybernetics
- Brain-computer integration

Impact and Relevance:

- Closed-loop models of human-system interaction
- Theoretical framework for adaptive integration of multisensory information to enhance Soldier capabilities
- Improve the integration of human and system in innovative Soldier technology solutions

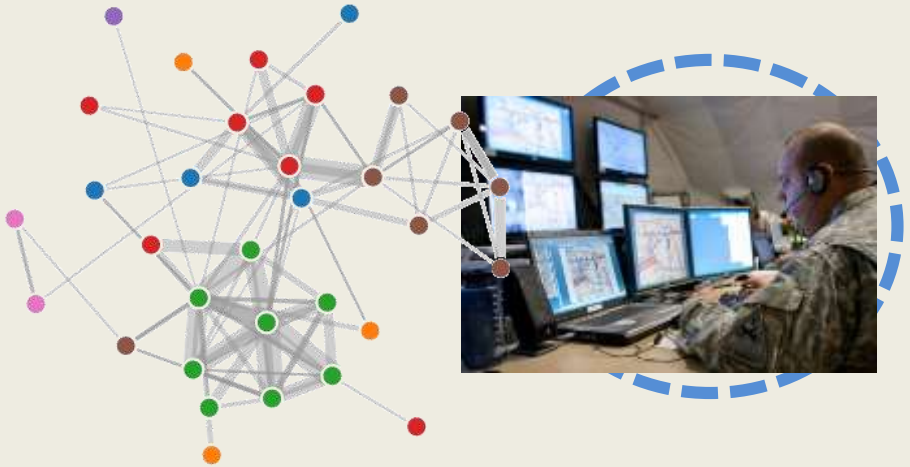


Cybernetic foundations

Integration of Humans and Systems: Humans in Multi-Agent Systems

Vision:

Faster and better-informed decisions, reduced Soldier workload, greater levels of situation understanding and management, strategic and tactical advantages in future operating environments



Impact and Relevance:

- Adaptive, intuitive, and seamless interactions in human-agent teaming
- Technological breakthroughs in agent-based decision-support systems
- Faster, better-informed decisions in increasingly complex environments
- Leverage socio-cultural dimensions to inform and influence complex and interconnected operational environments

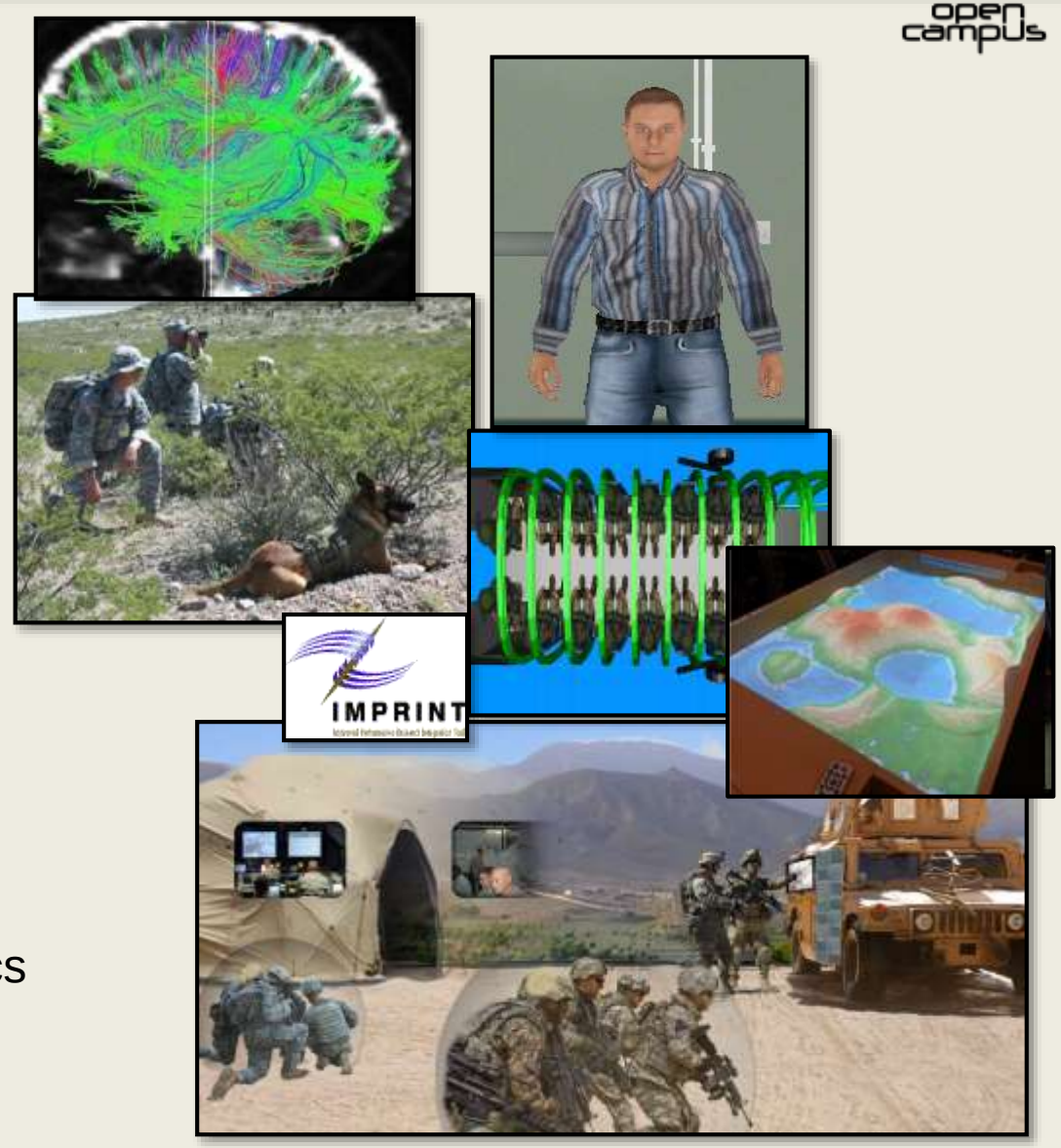
Technical Areas:

- Networked Team Performance
- Data-to-Decisions
- Trust
- Human-Agent Teaming
- Human Robotic Interaction
- Virtual Agent Social Dynamics
- Socio-Cultural Influences
- Human Dynamics of Cybersecurity
- Decision Support Systems

Human Sciences Personnel

Expertise in:

- Research & Engineering Psychology
- Training & Learning Science
- Human Factors Engineering
- Cognitive Science
- Neuroscience
- Biomechanics & Kinesiology
- Computer Science
- Modeling & Simulation
- Virtual Environments
- Research Audiology
- Industrial/Mechanical/Electronics Engineering



Open Campus Highlights…

Approved CRADAs

Development of cloud computing applications and technology for the delivery of simulations and training

Simulation-Based Training

Development of Advanced Modeling and Simulation (M&S) Technology for the Future M&S Training Capability

Optical Properties Influence Dynamic short Range Engagements

Pending CRADAs

BRIGHAM AND WOMEN'S HOSPITAL
HARVARD MEDICAL SCHOOL
UMBC AN HONORS UNIVERSITY IN MARYLAND
UCI University of California, Irvine

Human Sciences Centers

Simulation and Training Technology Center

- Advanced simulation across a broad range of applications to include prototype, concept exploration, design, evaluation, distributed human performance representation and analysis
- Training environments spanning live, virtual, and constructive
- Technologies for adaptive and individualized training and learning
- Specialized applications for medical training and simulation
- Located in Orlando, FL

Soldier Adaptive Systems Center

- Inaugural workshop – February 2016
- Research to explore, examine, and expand our understanding of the future of mutual Soldier – system adaptation in complex and dynamic environments
- Located at Aberdeen Proving Ground, MD

ARL Facilities: Mission Impact through Neuro-inspired Design (MIND) Laboratory

Environment for Neuroscience Research

- Designed for studying Soldier-system interactions
- Three acoustically treated and electrically shielded test chambers
- Control room for conducting multiple simultaneous research studies
- Flexible environmental control

On Human Sciences Tours - HS1, 4 & 7

ARL Facilities: Environment for Auditory Research (EAR)

Environment for Auditory Research (EAR): Sphere Room

World Class Auditory Perception and Communication Research Facility

- Sphere Room – simulate complex immersive acoustic environments
- Dome Room – accurately present target and masking sounds and measure ability to localize them
- Listening Lab – acoustically reconfigurable space for sound ID and speech perception as function of noise and room acoustics
- Distance Hall – simulate distance-related features of an auditory scene
- OpenEAR – 48,000 sq ft outdoor extension of EAR

On Human Sciences Tours - HS1, 4 & 7

Networked-Enabled Human-in-the-Loop Behavioral Research Facility

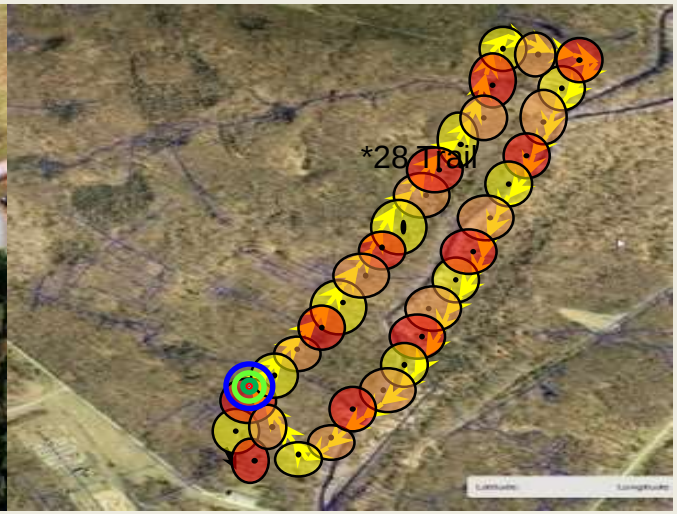
- Virtual Immersive 300° environment with weapons-fire system
- Cognitive robotics laboratory
- Simulated Tactical Operations Center (STOC)
- Isolated test chambers for distributed team performance
- Centralized observation/control room

Research and training with the VirTra 300° Immersive Simulator with Weapons-Fire System

On Human Sciences Tours - HS1, 4 & 7

State of the Art Facility to Study the Interactive Effects of Physical and Cognitive Stress

- Biomechanics Laboratory
  - 12 camera motion capture system
  - Force sensing treadmill
  - Cardiopulmonary exercise testing equipment
  - Electromyography equipment
- 500 meter long networked obstacle course
- 2.5 mile cross-country course through networked, woodland environment



On Human Sciences Tours – HS2, 3, 5, 6, & 8

ARL Facilities: Laboratories in Orlando, FL and Playa Vista, CA

SFC Paul Ray Smith, Simulation and Training Technology Center

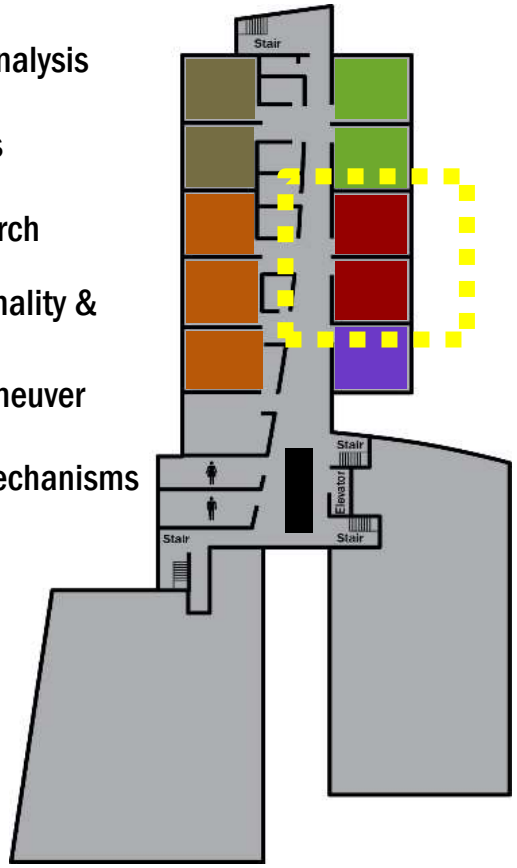
- Adaptive Tutoring Lab
- Virtual/Augmented Reality Lab
- Gaming Lab
- Visualization Testbed
- Medical Research/Tissue Lab
- Open Campus Laboratories at UCF Institute for Simulation and Training
- Army UARC - Institute for Creative Technologies at USC

ARL Open Campus Collaboration Opportunities

Mallette Center Second Floor

Poster Locations

- Assessment & Analysis
- Human Sciences
- Materials Research
- Sciences for Lethality & Protection
- Sciences for Maneuver
- Collaborative Mechanisms



Thank you