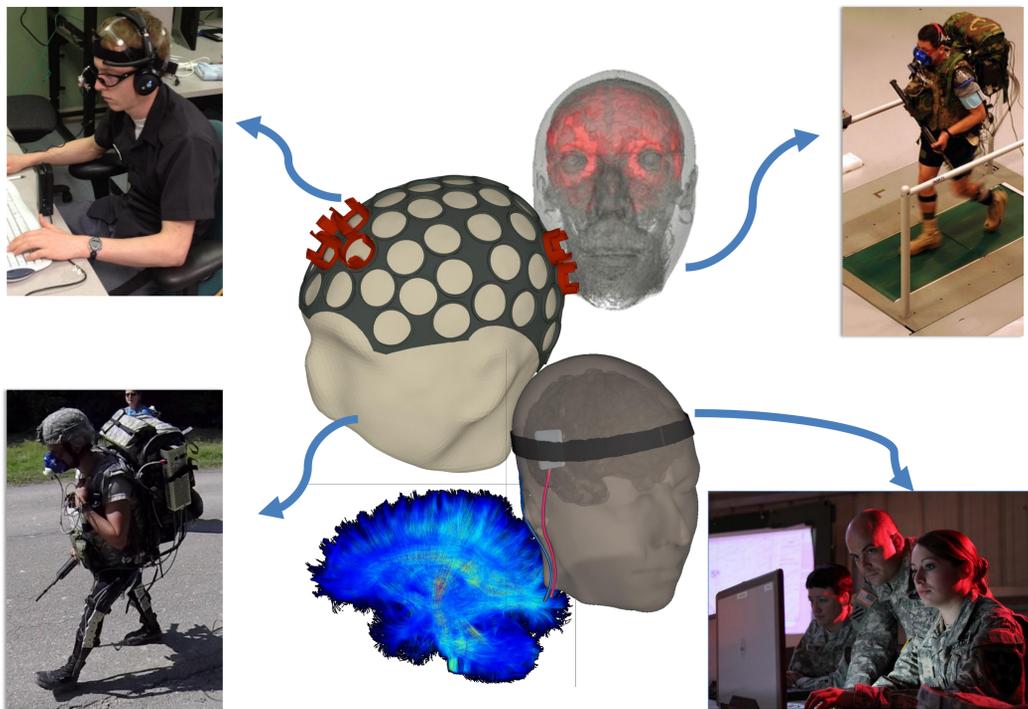


## S&T Campaign: Human Sciences Human Capability Enhancement Augmentation

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## Research Objective

- Rapidly enhance capabilities of individual Soldiers and units through the closed-loop integration of sensing, augmentation, and training technologies



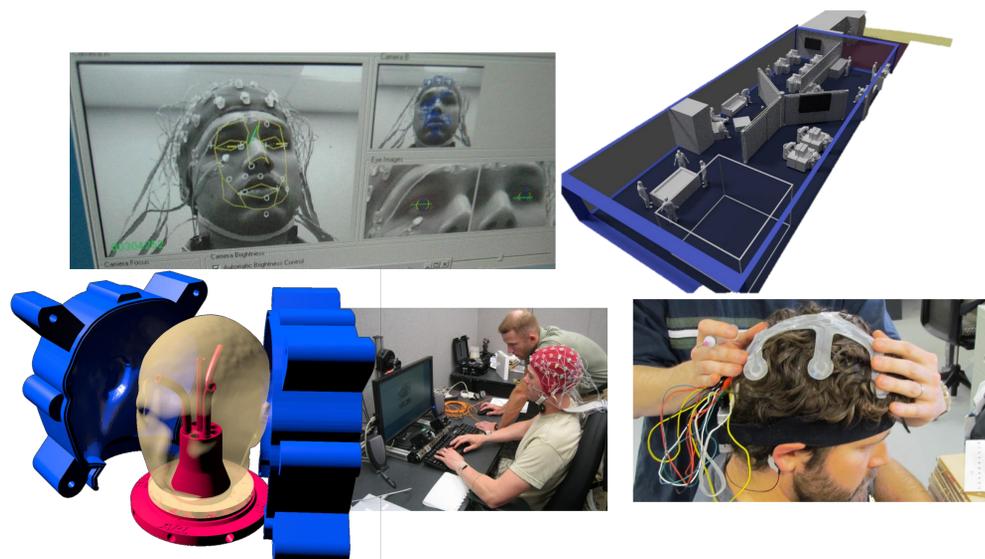
Neurotechnologies offer the ability to characterize and augment human performance both during training and during active task performance

## Challenges

- Existing neurostimulation research has demonstrated population-level effects, but often does not address individual differences in neurophysiology, behavior, or the trajectory of stimulation-augmented changes
- Closed-loop approaches are not common; stimulation is typically applied in an all-or-none, one-size-fits-all approach
- Small effect sizes make it difficult to explore complex structure-function-behavior relationships within complex settings

## ARL Facilities and Capabilities Available to Support Collaborative Research

- Laboratory facilities including shielded EEG chambers and kinematic tracking systems
- Rapid 3-D scanning, additive manufacturing, and CT materials characterization capabilities for individualized neurotechnologies
- Transcranial direct current stimulation (tDCS) and transcranial ultrasound stimulation (TUS) devices
- Conductive EEG phantoms for equipment characterization and methods validation
- Local computational cluster (1200+ cores, 12+ TB RAM) for large scale simulations and distributed data analysis
- Innovation Commons in development for rapid prototyping and pervasive sensing applications



## Complementary Expertise / Facilities / Capabilities Sought in Collaboration

We are seeking collaborators with expertise in:

- Control theory and dynamical systems analysis
- Transcranial stimulation technologies
- Neurofeedback approaches
- Mindfulness meditation interventions
- Longitudinal intervention experiments
- Functional and structural imaging methods
- Current flow and ultrasonic wave modeling
- Sensor and materials development
- Wearable technology design and physiological monitoring