

## S&T Campaign: Human Sciences Human Behavior Real-World Behavior

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## Research Objective

- Understand and model behavior and neurophysiology of visual recognition and visual search under real-world luminance
- Generalize models from standard dynamic range ('SDR', 100:1 contrast ratio) to high dynamic range ('HDR', >10000:1 contrast ratio) luminance



Examples of real-world high dynamic range (HDR) luminance across Soldier, AI/ML, and Human-agent teaming tasks

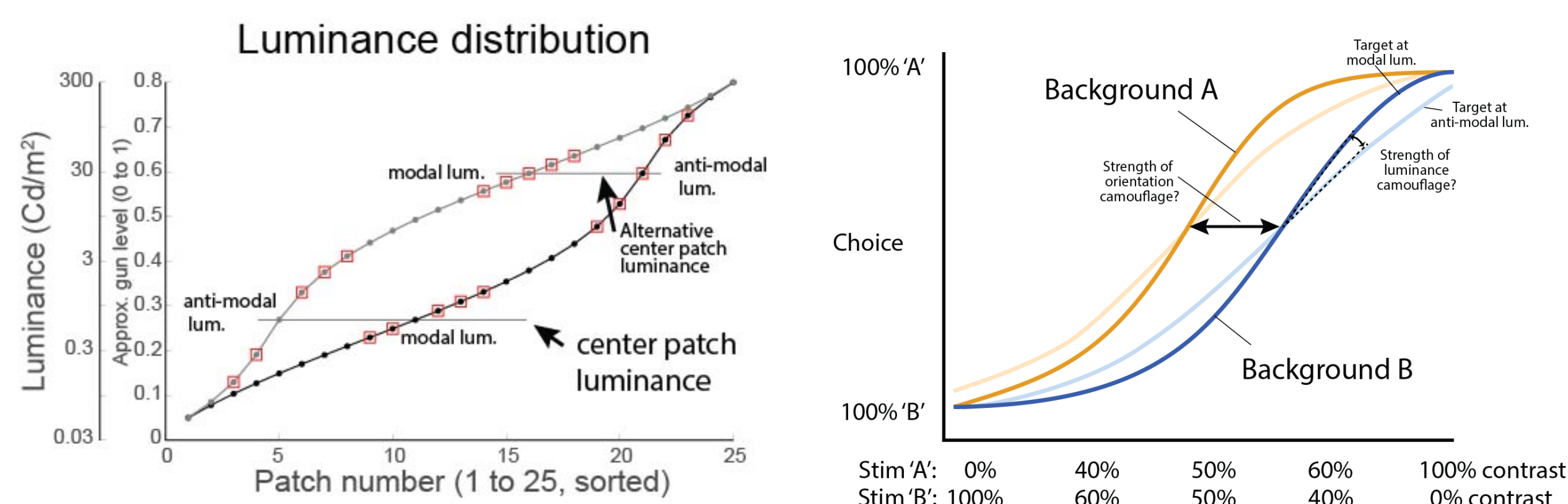
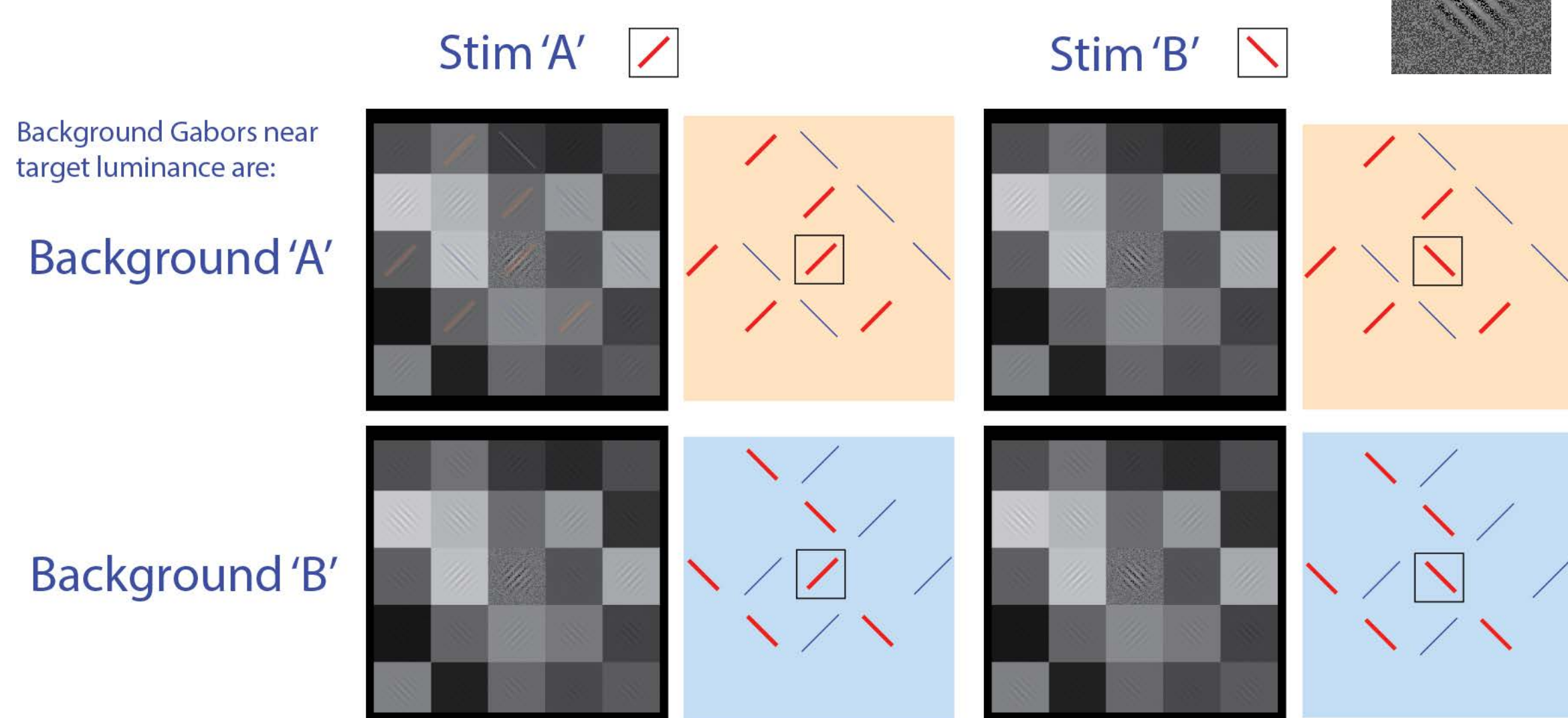
## ARL Facilities and Capabilities Available to Support Collaborative Research

- 12 bits-per-channel, 150000:1 ANSI contrast ratio (1.5M:1 dynamic contrast), 1900 lumen stimulus projector (JVC RS600U)
- Psychtoolbox 12 bpc development testbed (1st laboratory to test 12 bpc)
- Eyelink eye tracker
- BioSemi EEG system, up to 128 channels
- Expertise in eye tracking, neurophysiology, and computational modeling

## Challenges

- Computational vision models are based on SDR; virtually no behavioral or neurophysiological data exists for HDR luminance
- Academic laboratories still use 8-10 bits per channel; software and equipment for 11 or 12 bit high-contrast displays are still being developed

Task 1: 2AFC Center patch sequence: noise target noise



Two-alternative forced choice psychometric task, measuring orientation discrimination of a central target surrounded by flankers of different orientations and luminances.

## Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- Knowledge of real-world Army-relevant luminance scenarios and tasks
- Capability to create labeled video database of real-world Soldier tasks
- Capability to synthesize HDR luminance scenarios from video motion capture
- Knowledge of real-world luminance manipulation capabilities
- Expertise in normalization challenges in Real World Behavior
- Expertise in normalization challenges in machine learning
- Expertise in small form factor low-power machine vision
- Expertise in optics