



Army Research Laboratory (ARL) West  
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## ARL West Acknowledged by DEVCOM Deputy Commanding General as an Authority Across the West Coast

ARL West has been acknowledged by DEVCOM Deputy Commanding General BG(R) Bienlien at the Change of Command Ceremony that took place 8 June 2021. He stated that ARL West is an authority across the West Coast for establishing a vast consortium of trusted researchers, venture capital, startups, and academia as a shining example of catalyzing and synergizing an entire regional ecosystem to solve complex Army problems. One of the wayforward items includes CPT Brian Thorn, the aide-de-camp to BG(R) Bienlien, continuing to interface with ARL West on an on-going basis. This developmental assignment will expose CPT Thorn to the foundational aspects of venture capital and early-stage innovation organizations.

CPT Thorn is the current commander of the DEVCOM Soldier Center Headquarters Research and Development Detachment (HRDD) that coordinates Human Research Volunteers to increase Soldier touch points in the science and technology process. Hence, there is considerable bi-directional impact as we increase tech awareness to our promising emerging leaders like CPT Thorn and reciprocally influence the strategic priorities of venture capital and the direction of their future portfolio companies.



Drs. Javi Garcia, Pete Khooshabeh (ARL West), COL Ron Corsetti (75th IC), Andrew Feldman (CEO Cerebras), BG(R) Bienlien, Jeff Forte (VP Cerebras), CPT Brian Thorn, COL Greg Olinger (75th IC) at Cerebras data center

## Our Mission

The laboratory's purpose is to create and harness scientific knowledge for transformational overmatch. By combining its in-house technical expertise with those from academic and industry partners, ARL focuses on knowledge products that offer incredible potential to improve the Army's chances of surviving and winning any future conflicts.

The ARL West regional ecosystem represents unique capabilities and partnerships from across the technical and entertainment industries, venture communities, colleges and universities, in addition to other diverse academic partners across the West Coast.

### Technical Focus Areas

- Human and Information Interaction (HII)
- Natural "Hands-Free" Communication and Multi-Agent UAS Simulation
- Computer Vision
- Machine Learning Software and Hardware
- Emerging Semiconductor Materials

### People

- 23 ARL government employees and 27 contractors, faculty, student research assistants, and post-docs
- Collaborating with several regional universities, co-located with the Army's University Affiliated Research Centers, the University of Southern California Institute for Creative Technologies and Institute for Collaborative Biotechnologies

### Contact Us

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## VCS of the Air Force Trilateral Strategic Studies Group Visits ARL West

DEVCOM ARL hosted the Vice Chief of Staff of the Air Force Trilateral Strategic Studies Group (SSG) at ARL West to discuss the SSG's FY22 study on "the human as a weapon system". ARL partners from academia (University of Southern California) and industry (Share Ventures and Harpoon Ventures) also participated in the discussion. ARL described relevant ongoing basic and applied research including: the ARL Human Autonomy Teaming Essential Research Program, training for adaptability to novel technologies, individualized performance and readiness monitoring, virtual reality for command and control, and advances in robotic environment manipulation. Following the briefings, the group discussed best practices for operationalizing science and technology for human performance and involving the entrepreneur community in maturing dual-use technologies to support SSG's kick off of the human weapon system study in FY22.



ARL, Harpoon and Share Ventures participating in a discussion with the Vice Chief of Staff of the Air Force Trilateral Strategic Studies Group at ARL West.

## HASC Chairman Visits Stanford



Dr. Nilay Papila, Prof. Fu-Kuo Chang, Dr. Jeff Decker (all Stanford), Congressman Smith, Dr. Pete Khooshabeh and Javi Garcia (ARL) during the HASC visit to Stanford University

Congressman Adam Smith, Chairman of the House Armed Services Committee (HASC), visited with ARL West partner Stanford University in Palo Alto, CA on 14 July 2021. Chairman Smith opened the meeting by stating his priority to shorten the innovation to capability adoption timeline in the area of information warfare. Dr. Jeff Decker, the Stanford University Hacking For Defense (H4D) Program Director, briefed relevant research mapping the Army innovation ecosystem in order to help promising H4D projects and commercial startups develop a go-to-market strategy that includes potential Army and DoD customers. To amplify this opportunity, Professor Chris Ré gave several examples of DARPA funded research transitioned as successful startups, e.g. SambaNova, a three-year old, \$5.1B Artificial Intelligence (AI) hardware venture. Dr. Khooshabehadeh, ARL West,

emphasized how all regional sites build trusted relationships with academic and industry partners to design cooperative agreements that accelerate capability maturation and foster talent development. Professor Steve Blank highlighted the need for an "Innovation Sherpa", a person dedicated to guiding the developer through the transition process and assisting in how Stanford and partners can harness emerging research opportunities to connect early stage innovations to military capabilities. As a way forward, ARL will support any follow-on briefings to discuss enhanced methods for operationalizing science from West Coast academic and commercial research.

**UC Riverside Researchers Collaborate with ARL's Cross-Reality Team**



**Dr. Jiasi Chen**

Dr. Jiasi Chen, an associate professor in the Department of Computer Science and Engineering at the University of California, Riverside and graduate student Tandy Dang collaborated with researchers at ARL West through the Defense Threat Reduction Agency (DTRA). Over the summer, they developed a prototype for communicating terrain data in near real-time between multiple augmented and virtual reality clients. A motivating use case, for example, could be a soldier in the field observing the terrain in real-time, and sending that data back to headquarters for 3D visualization in VR. The prototype was built on top of the [AURORA](#) Cross Reality (XR) platform and involved communication between an AR device (a Microsoft HoloLens 2) collecting terrain data, and a VR client viewing this data. At the conclusion of the project, the prototype was successfully demonstrated with near real-time performance (e.g., 5-6 seconds of end-to-end latency), and enabled the ability to identify several computation and network bottlenecks. This prototype provides a platform for future research on adaptation to constrained bandwidth/connectivity, terrain data consistency, and efficiency of cloud-based network architectures.



U.S. Army COL Jason M. Railsback, Director of Command and General Staff School's Department of Joint, Interagency, and Multinational Operations conducts familiarization with Army Research Lab's XR-COP

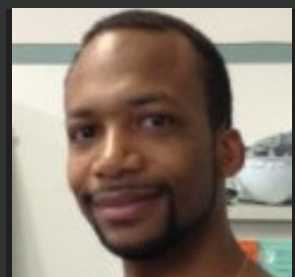
**ARL's Cross Reality COP Assessed at MCBL's First Technical Excursion**

In support of the Mission Command Capability Development Integration Directorate's (MC CDID) FC2IS effort, the Mission Command Battle Lab (MCBL) and DEVCOM ARL's Battlefield Information Systems Branch (BISB) conducted a [technical excursion](#) from 12-15 July 2021 at Fort Leavenworth, Kansas. The TechEx focused on using ARL's XR Common Operating Picture (XR-COP) to explore enabling operations from distributed command posts in order to develop shared understanding and support decision-making. During the experiment, participant analysts provided a back-brief to personnel role-playing a division commander utilizing the XR-COP to simulate an in-person Combined Arms Rehearsal. The experiment utilized direct observation,

focused surveys, and facilitated discussion to gather data relevant to the assessment of XR technologies to enable decentralized command posts. The XR-COP was very well received by the participants at MCBL who consistently praised the system and offered additional ideas and use cases for future research and development. The MCBL Science and Technology branch developed and published an appendix to the initial FC2IS Seminar Event Report (published in June 2021) that captured additional analysis and results from the TechEx. BISB researchers will continue to work with MCBL to analyze the data and plan for future collaborative experiments in XR-enabled C2.

**Intern Spotlight - Enlisted Service Member Clint Anderson**

Leading Chief Petty Officer for the Navy Reserve Operational Support Command, NOSC Los Angeles, Clinton Anderson interned with DEVCOM ARL through the Summer Student Experience educational program. As a current Masters student, studying Cybersecurity at the Naval Postgraduate School in Monterey, Clint's summer research project included an extensive overview of fuzzing tools in addition to exploring how software and various operating systems integrate development environments to work in conjunction with a secure fuzzing platform. This technique is important to the Army because it rigorously tests software for bugs and other potential failures. While working with ARL West, Clint was able to achieve many objectives which include providing a repeatable fuzzing framework, creating documentation, and researching various security application tests.



**Clint Anderson**

## Pacific Northwest Spotlight on Robotics



Dr. Chad Kessens at the University of Washington with two complex limbed robots

In October of 2019, a delegation of ARL West representatives visited universities in the Pacific Northwest with the goal of establishing research relationships with academic partners in the region. The universities visited included the University of Washington (UW), Oregon State University (OSU), and the University of Oregon (UO).

At OSU, the delegation met with Dr. Julie Adams, a professor in the robotics department, resulting in the CRADA “Collaborative Robotics in the Modern Battlefield” which was finalized in July of 2020. Under this CRADA, Nathan Schomer was temporarily reassigned from ARL West in Playa Vista, CA to OSU, where he is pursuing a Master’s degree in robotics with Dr. Adams as his advisor. Mr. Schomer’s research focuses on multi-robot control along with its practical limitations and potential vulnerabilities. During the first year at OSU, this research




included work on emergent teaming behaviors from large-population swarms. Additionally, Mr. Schomer has begun work on Wilderness Search and Rescue (WiSAR) applications of small population collectives of Group 1 (< 20lb) unmanned aerial vehicles. Improved methods of finding a target with limited and stale information in a complex, harsh environment would be beneficial to the Army across many DoD applications.

The ARL West delegation also met with Profs. Siddhartha Srinivasa and Byron Boots at UW, leading to a CRADA “Dynamic Mobile Manipulation in Unstructured Environments” which was executed in July 2020. Dr. Chad Kessens relocated to Seattle to pursue this important work aimed at technologies that can perform physical work to reshape the battlefield, as well as to represent ARL interests in one of the major US tech hotspots. In January 2021, Rosario Scalise was hired as an ORAU Fellow to support efforts at generalized self-righting while pursuing his Ph.D. in Prof. Boots’ lab. The ability to robustly recover from tip-over will facilitate high speed mobility through rough terrain by mitigating risk. The Pacific Northwest region is rife with opportunities to engage top tier partners in academia and industry through collaboration and transition.

### Next Issue:

- Spotlight on Dr. Eric Holder and Arizona State University
- Black Files Declassified Episode for Discovery Science channel
- ARL collaboration with Dr. David Krum from California State University through DTRA fellowship

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