



SMA Panel Discussion

Leveraging Cognitive Science and Technology for Learning and Action

Booklet

Tuesday, 27 November 2018

1030-1200 ET

**Dial (866) 712-4038;
Passcode 37250264#**

Strategic Multi-Layer Assessment (SMA) provides planning support to Commands with complex operational imperatives requiring multi-agency, multi-disciplinary solutions that are NOT within core Service/Agency competency. Solutions and participants are sought across USG and beyond. SMA is accepted and synchronized by Joint Staff/J-39 DDGO and executed by ASD (EC&P).

Agenda

Panel Description:

This panel discussion will address how various groups are using insights from cognitive sciences to improve human performance and learning, as well as how we're leveraging emerging research and technologies to do this even better.

Speakers and Topics of Discussion:

Lt Col Dave Lyle (AETC / Air University)

Introduction

Dr. Michael Bunting (University of Maryland Center for Advanced Study of Language)

Dr. Petra Bradley (University of Maryland Center for Advanced Study of Language)

Dr. Jared Linck (University of Maryland Center for Advanced Study of Language)

Human / Machine Teaming via Augmented & Virtual Reality

Implantable neural interfaces, infrared and ultraviolet goggles for vast visual acuity, and virtual reality soldiers are just some examples of future tech that promise to cause information overload in ways not experienced before. The University of Maryland Center for Advanced Study of Language (CASL) has a decade-long program on overcoming information overload. The purpose of this talk is to highlight some recent research endeavors, including development of a theoretical model of the cognitive and non-cognitive factors on performance in virtual environments and learning principles for training in virtual reality.

Dr. Kevin Gluck (Air Force Research Labs Human Trust and Interaction Branch)

Cognitive Science at AFRL: Some Research Highlights

In this presentation I will provide a brief introduction to enduring cognitive science research interests at the Air Force Research Laboratory. A focus will be on research in performance prediction for adaptive scheduling of learning events.

Lt Col Paul Vicars (Pilot Training Next)

Maj Travis Sheets (Pilot Training Next)

Pilot Training Next: Path to Next Generation Learning

PTN is AETC's innovation effort to discover how new and emerging technology can help the Air Force optimize learning for Airmen. The vision is to individualize training/learning to optimize it the speed of the learner.

Dr. Andy Stricker (Air University – Mars Expedition Immersive VR Simulation)

Mars Expedition Immersive Simulation: Development of Mindsets with Contemplative Practices Facing Complicated and Complex Challenges

This presentation offers an overview of an immersive VR simulation constructed to assist the development of mindsets with contemplative practices for facing complicated and complex challenges. The simulation makes use of an AI-Augmented Mindset Aid for offering assistance using the Web Ontology Language (OWL) for supporting reasoning relevant to a variety of complicated and complex challenges associated with the exploration of space.

Speaker Biographies

Dr. Michael Bunting

University of Maryland Center for Advanced Study of Language

Dr. Michael Bunting is a Research Scientist and the Director of Research for the University of Maryland Center for Advanced Study of Language (CASL) and has led groundbreaking research in cognition and aptitude assessment. He and his collaborators have developed aptitude tests for the U.S. military and government civilians, including tests of aptitude for foreign language acquisition, aptitude for cyber security, and aptitude for computer programming. His research interests are the nature, organization, and trainability of working memory and selective attention; the structure of the inductive reasoning domain and the relationship between reasoning ability (general fluid intelligence) and working memory capacity; and, the cognitive and non-cognitive determinants of human aptitude and acquired abilities, including complex skill acquisition and aptitude for foreign language learning. Prior to joining CASL, he was as a Postdoctoral Fellow in the Missouri Rehabilitation Research Training Program and Dr. Nelson Cowan's Attention and Working Memory Laboratory at the University of Missouri at Columbia. Dr. Bunting has a successful record of scholarly publication, and in 2006, he received a new investigator award from the American Psychological Association for his publication in the *Journal of Experimental Psychology: Learning, Memory & Cognition*.

Dr. Petra Bradley

University of Maryland Center for Advanced Study of Language

Dr. Petra Bradley is an Associate Research Scientist and Mission Strategist for Operational Effectiveness and Evaluation at the University of Maryland Center for Advanced Study of Language (CASL). She is a cognitive psychologist specializing in metacognition and judgment & decision making. Her work has focused on operational use of technology for language and intelligence analysis. Her current interest is building a model of appropriate levels of access and trust to reduce organizational vulnerability to threat from malicious and negligent employees.

Dr. Kevin Gluck

Air Force Research Labs Human Trust and Interaction Branch

Kevin Alexander Gluck, PhD is a Principal Cognitive Scientist with the Air Force Research Laboratory. He began his career with the Air Force in 1993, first as a summer intern and then as a contractor research assistant at Lackland Air Force Base, supporting intelligent tutoring systems research. He became a government civilian scientist in 1996 when he was awarded a PALACE Knight Graduate Training Fellowship while pursuing his PhD in Cognitive Psychology at Carnegie Mellon University. Upon completion of that degree, Kevin started with AFRL at the Mesa Research Site in Arizona, eventually relocating to Wright-Patterson Air Force Base, Ohio. In portions of 2010 and 2011, he held a "Gastwissenschaftler" (Visiting Scientist) position at the Max Planck Institute for Human Development in Berlin, Germany. In 2011 he was honored to receive the Governing Board Award for Distinguished Service to the Cognitive Science Society and in 2014 started a 6-year term on the Cognitive Science Society Governing Board. Kevin has authored or co-authored more than 80 peer-reviewed publications, is co-inventor on two U.S. patents, and has played a lead role in the organization and management of 13 international conferences and workshops. He is the Airman Systems Directorate's Core Research Area Lead for Personalized Learning and Readiness Sciences. Kevin's enduring research interests and activities focus on computational and mathematical models of cognitive processes to explain and improve human performance.



EDUCATION

1993 B.A. in Psychology, Trinity University
1997 M.S. in Cognitive Psychology, Carnegie Mellon University
1999 Ph.D. in Cognitive Psychology, Carnegie Mellon University
2008 Senior Executive Fellows Program at Harvard's Kennedy School of Government

CAREER CHRONOLOGY

1993 Research Assistant, Armstrong Laboratory, Brooks AFB, TX

1993-1995 Assistant Research Psychologist, Galaxy Scientific Corporation
1996-1999 PALACE Knight Graduate Training Fellowship
1996-2005 Research Psychologist, Air Force Research Laboratory
2001-2006 Adjunct Faculty, Arizona State University, Polytechnic Campus
2005-2011 Conference Officer, Cognitive Science Society
2005-2013 Senior Cognitive Scientist, Air Force Research Laboratory
2010-2011 Visiting Scientist, Max Planck Institute for Human Development, Berlin
2014- present Principal Cognitive Scientist, Air Force Research Laboratory
2014- present Adjunct Faculty, Wright State University
2014- present Governing Board, Cognitive Science Society
2015- present Graduate Faculty Scholar, University of Central Florida

AWARDS AND HONORS

2001 Human Effectiveness Directorate Scientific/Technical Civilian of the 3rd Quarter
2002 USAF Modeling and Simulation Award for Training
2003 Siegel-Wolf Award for Best Applied Research – International Conference on Cognitive Modeling
2006 Best Paper - Interservice/Industry Training, Simulation, and Education Conference
2006 AFOSR Star Team Award
2006 Research Adviser for the National Research Council Research Associateship Program
2007 Computational Modeling Prize for Best Applied Cognition Paper at CogSci 2007
2007 Mentor of the Year – Warfighter Readiness Research Division
2008 NATO RTO Human Factors and Medicine Scientific Achievement Award
2010 AFOSR Window on the World Grant Recipient
2011 Governing Board Award for Distinguished Service to the Cognitive Science Society
2015 Collaboration Award - Human Effectiveness Directorate

SELECTED PUBLICATIONS

Gluck, K. A., Jastrzemski, T., & Krusmark, K. (in press). Prospective comments on performance prediction for aviation psychology. To appear in M. A. Vidulich & P. S. Tsang (Eds.), *Advances in aviation psychology*, volume 3: Improving aviation performance through applying engineering psychology. Boca Raton, FL: CRC Press.

Walsh, M. W., Gluck, K. A., Gunzelmann, G., Jastrzemski, T., & Krusmark, M. (2018). Evaluating the theoretical adequacy and applied potential of computational models of the spacing effect. *Cognitive Science*, 42(S3), 644-691. (DOI: 10.1111/cogs.12602).

Laird, J. E., Gluck, K. A., Anderson, J. R., Forbus, K., Jenkins, O., Lebiere, C., Salvucci, D., Scheutz, M., Thomaz, A., Trafton, G., Wray, R., Mohan, S., & Kirk, J. (2017). Interactive task learning. *IEEE Intelligent Systems*, 32(4), 6-21, (invited).

Collins, M., Juvina, I., Gluck, K. A. (2016). Cognitive model of trust dynamics predicts outcomes within and between two games of strategic interaction. *Frontiers in Psychology*, 6. (DOI: 10.3389/fpsyg.2016.00049)

Veksler, V. D., Myers, C. W., & Gluck, K. A. (2015). Model flexibility analysis. *Psychological Review*, 122(4), 755-769. (DOI: 10.1037/a0039657)

Gunzelmann, G., Veksler, B. Z., Walsh, M. M., & Gluck, K. A. (2015). Understanding and predicting the cognitive effects of sleep loss through simulation. *Translational Issues in Psychological Science*, 1(1), 106-115. (DOI: 10.1037/tps0000017)

Walsh, M. W., & Gluck, K. A. (2015). Verbalization of decision strategies in multiple-cue probabilistic inference. *Journal of Behavioral Decision Making*, 29, 78-91. (DOI: 10.1002/bdm.1878)

Walsh, M. W., & Gluck, K. A. (2014). Mechanisms for robust cognition. *Cognitive Science*, 39, 1131- 1171. (DOI: 10.1111/cogs.12192)

Gluck, K. A., & Gunzelmann, G. (2013). Computational process modeling and cognitive stressors: Background and prospects for application in cognitive engineering. In J. D. Lee & A. Kirlik (Eds.) *The Oxford Handbook of Cognitive Engineering* (pp. 424-432). New York, NY: Oxford University Press.

Gluck, K. A., McNamara, J. M., Brighton, H., Dayan, P., Kareev, Y., Krause, J., Kurzban, R., Selten, R., Stevens, J. R., Voelkl, B., & Wimsatt, W. C. (2012). Robustness in a variable environment. In J. R. Stevens & P. Hammerstein (Eds.) *Evolution and the Mechanisms of Decision Making* (pp. 195-214). Strüngmann Forum Report, vol. 11, J. Lupp, series ed. Cambridge, MA: MIT Press.

Gluck, K. A. (2010). Cognitive architectures for human factors in aviation. In E. Salas & D. Maurino (Eds.) *Human Factors in Aviation*, 2nd Edition (pp. 375-400). New York, NY: Elsevier.

Gunzelmann, G., & Gluck, K. A. (2009). An integrative approach to understanding and predicting the consequences of fatigue on cognitive performance. *Cognitive Technology*, 14(1), 14-25.

Gunzelmann, G., Gross, J. B., Gluck, K. A., & Dinges, D. F. (2009). Sleep deprivation and sustained attention performance: Integrating mathematical and cognitive modeling. *Cognitive Science*, 33(5), 880-910. (DOI: 10.1111/j.1551-6709.2009.01032.x)

Gluck, K. A. & Pew, R. W. (Eds.). (2005). Modeling human behavior with integrated cognitive architectures: Comparison, evaluation, and validation. Mahwah, NJ: Lawrence Erlbaum Associates.

Dr. Jared Linck

University of Maryland Center for Advanced Study of Language

Dr. Jared Linck is a Research Scientist and Mission Strategist for Workforce Readiness and Training at the University of Maryland Center for Advanced Study of Language (CASL). He holds a PhD in Cognitive Psychology from The Pennsylvania State University. At CASL, he leads a team of researchers who specialize in quantifying and evaluating aptitude, training, achievement, and mission readiness. CASL's aptitude and tailored training products improve selection, placement, and feedback to learners. Dr. Linck's research interests include the psycholinguistics of multilingual language processing, second language acquisition, individual differences in learning processes and outcomes, and the impact of the context on language learning (e.g., immersion, online).

Lt Col Dave Lyle

Air Education and Training Command (AETC) and Air University

Lieutenant Colonel Lyle (USAFA; MBA, Louisiana Tech; MMAS, US Army Command and General Staff College; MAAS, School of Advanced Air and Space Studies) is the Deputy Director for Strategy & Concepts at the Curtis E. LeMay Center for Doctrine Development and Education, Maxwell AFB, Alabama. He has served in various assignments related to command and control in the past 10 years, including air and space operations center (AOC) assignments at the 613 AOC and combined air operations center; PACAF Inspector General AOC inspector; director of operations for the 505th Combat Training Squadron; various assignments in joint air component coordination elements, including as the A-5 (Strategic Plans) of the 9th Air and Space Expeditionary Task Force–Afghanistan in Kabul; and director of staff for the 505th Command and Control Wing, Hurlburt Field, Florida. He was an AOC initial qualification training honor graduate and Command and Control Warrior Advanced Course graduate, holding US Army qualifications as a joint planner and distinguished master strategist. A master navigator with more than 2,400 flying hours in the B-52H, Lieutenant Colonel Lyle flew 43 combat missions over Kosovo and Afghanistan.



Dr. Andy Stricker

Air University – Mars Expedition Immersive VR Simulation

Dr. Andrew Stricker serves Air University as a distributed learning architect. In this role he helps to apply advances in learning and assessment sciences into U.S. Air Force educational and professional military education programs. Prior to his arrival to Air University Andrew served Vanderbilt University as Associate Provost for Innovation Through Technology. He was responsible for working with academic, technology and administrative leaders to prioritize, plan, and enable innovations for improving learning, teaching and research. Dr. Stricker also spent four years at Texas A&M University, College Station, Texas, creating and then serving as Director of the Cognition and Instructional Technologies Laboratory, and Director of the Knowledge Engineering Complex with the Texas Engineering Extension Service. He retired from the United States Air Force with 28 years of professional experience as an Air Force officer and scientist specializing in systems integration, human-factors engineering and cognitive sciences. His graduate work was conducted at Texas A&M University, College Station, Texas and Yale University, New Haven, Connecticut. He is a member of the American Psychological Association. His current research addresses developmental growth in reflective mindsets and contemplative practices. Dr. Stricker also engages in collaborative design of assistive immersive 3D virtual and augmented reality simulations for helping to improve complex problem-solving among teams.



Lt Col Paul Vicars

Pilot Training Next Initiative

Lt Col Vicars is the lead for the Pilot Training Next Initiative, Bergstrom Airport, Austin, Texas. He is responsible for exploring the potential of current and emerging technologies in the context of USAF flight training.

Lt Col Vicars was commissioned in 1999 at AFROTC Detachment 157, Embry-Riddle University, Daytona Beach, Florida. He has flown the F-16 in South Korea, as a Forward Air Controller-Airborne in Alaska, as well as in support of Operation Noble Eagle in Guam. He has also served in the Joint Operations Center, Combined Forces Command, Kabul, Afghanistan. He has joint service on staff at U.S. Pacific Command, as well as joint education at Fort Leavenworth, Kansas.

Lt Col Vicars is a command pilot with over 1,900 hours in the F-16 and T-38.

