Torin K. Clark, Ph.D.

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ACADEMIC APPOINTMENTS

2015 – present UNIVERSITY OF COLORADO AT BOULER (Boulder, Co.)
Assistant Professor, Smead Aerospace Engineering Sciences (2016-present)
Faculty Affiliate, BioServe Space Technologies (2016-present)
Visiting Assistant Professor (2015-2016)

2013 – 2016 MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Cambridge, Mass.)
Research Affiliate, Man Vehicle Laboratory

2013 – 2015 HARVARD MEDICAL SCHOOL (Boston, Mass.)
National Space Biomedical Research Institute First Award (Post-doctoral) Fellow
Jenks Vestibular Physiology Laboratory, Massachusetts Eye and Ear Infirmary, Otology and Laryngology

EDUCATION

2008 – 2013 MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Cambridge, Mass.)
Doctor of Philosophy, August 2013
Humans in Aerospace Engineering, Department of Aeronautics and Astronautics
Minor Area: Control of Autonomous Systems
Master of Science, June 2010
Department of Aeronautics and Astronautics

2004 – 2008 UNIVERSITY OF COLORADO AT BOULDER (Boulder, Col.)
Bachelor of Science, May 2008
Department of Aerospace Engineering Sciences, Summa Cum Laude
Minor in Applied Mathematics

RESEARCH EXPERIENCE

2015 – Present UNIVERSITY OF COLORADO-BOULDER (Boulder, Colo.)
Assistant Professor – Bioastronautics Laboratory, Smead Aerospace Engineering Sciences

2013 – 2015 HARVARD MEDICAL SCHOOL (Boston, Mass.)
Post-doctoral Fellow – Jenks Vestibular Physiology Laboratory, Massachusetts Eye and Ear Infirmary, Otology and Laryngology
Mentor: Prof. Daniel M. Merfeld (Massachusetts Eye and Ear Infirmary)

2010 – 2013 MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Cambridge, Mass.)
Research Assistant – Man-Vehicle Laboratory & Charles Stark Draper Laboratory
Thesis Title: Human Perception and Control of Vehicle Roll Tilt in Hyper-Gravity
Committee: Prof. Laurence R. Young (MIT), Dr. Charles M. Oman (MIT), Prof. Daniel M. Merfeld (Massachusetts Eye and Ear Infirmary), Dr. Kevin R. Duda (Draper)

2008 – 2010 MASSACHUSETTS INSTITUTE OF TECHNOLOGY (Cambridge, Mass.)
Research Assistant – Man-Vehicle Laboratory & Charles Stark Draper Laboratory
Thesis Title: Human Spatial Orientation Perception during Simulated Lunar Landing
Advisors: Prof. Laurence R. Young (MIT), Dr. Kevin R. Duda (Draper)

2006 – 2008 UNIVERSITY OF COLORADO AT BOULDER (Boulder, Col.)
Undergraduate Research Assistant, Microfluidics Laboratory
Advisor: Prof. Kamran Mohseni (Univ of Colorado, currently at Univ of Florida)

TEACHING/LECTURING EXPERIENCE

2017, Fall ASEN 6519: HUMAN OPERATION OF AEROSPACE VEHICLES

Solo developed CU advanced graduate course (one semester, 3 credits, 3 hrs lecture). 15 students. Examines the role, capabilities, and limitations of human operators in aerospace vehicles. Topics include theoretical models of human information processing and decision-making, physiological limitations of the human (particularly spatial orientation illusions), the design of display and control interfaces, and the evaluation of those interfaces for human interaction with complex aerospace systems.

2017, Spring ASEN 2004: AEROSPACE VEHICLE DESIGN AND PERFORMANCE

Co-taught CU sophomore year course (one semester, 5 credits, 3 hrs lecture + 4 hrs lab/week). 155 students and 3 lab sections. Taught the "space" portion of the course, covering spacecraft subsystems, orbital mechanics, rocket equations, and spacecraft performance (Dr. Gerren led the "airplane" portion).

2016, Fall ASEN 5158: SPACE HABITAT DESIGN

Taught CU graduate course (one semester, 3 credits, 3 hrs lecture). 35 students (23 in class, and 12 total distance students). Taught the factors that affect space habitat design, subsystems, and helped apply a systems engineering approach to the design of a "space hotel" in a semester-long group project.

2016, Spring ASEN 2004: AEROSPACE VEHICLE DESIGN AND PERFORMANCE

Co-taught CU sophomore year course (one semester, 5 credits, 3 hrs lecture + 4 hrs lab/week). 135 students and 3 lab sections. Taught the "space" portion of the course, covering spacecraft subsystems, orbital mechanics, rocket equations, and spacecraft performance (Dr. Gerren led the "airplane" portion).

2015, Fall INVITED PRESENTATION TO CORNELL UNIVERSITY COURSE

Provided a 1.5 hr invited lecture to a group of senior undergraduate and graduate students entitled "Sensorimotor/Vestibular Alternations of Spaceflight" as part of the course MAE 6850 – Space Biomedical Engineering and Human Performance. Contact: Dr. Ana Diaz Artiles

2014, Fall 16.459: BIOENGINEERING JOURNAL ARTICLE SEMINAR

Co-taught MIT graduate course (one semester, 2 credits, meets for 1 hour per week). Redesigned course structure and grading. Wrote and graded weekly quizzes. Led class discussions and met with students individually to select papers. Determined final course grades. Subject Evaluation Reports: overall course rating = 5.8/7 where 7 is best; my individual instructor rating = 6.4/7 ("stimulated interest" = 6.3/7, "displayed thorough knowledge of the subject material" = 6.6/7, "helped me learn" = 6.1/7).

2014, Sept 30 INVITED PRESENTATION TO "SPACE NERDS OF BOSTON"

Provided a 1.5 hr invited presentation to a group of 30 professionals entitled "Why we aren't designed for space: the physiological and psychological challenges of humans living in space and what can be done about them" Contact: Brandish Shah

2014, May 29 INVITED PRESENTATION, NSBRI SUMMER BIOASTRONAUTICS INSTITUTE

Provided a 1.5 hr invited presentation to a group of 35 NASA/NSBRI interns, students, and post-doctoral fellows as part of NSBRI's Summer Bioastronautics Institute. Contact: Dr. Ronald McNeel

2014, Spring HST.514J / 16.430J: SENSORY NEURAL-SYSTEMS

Co-taught Harvard/MIT Higher-level graduate course (one semester, 12 credits, meets for 3 hours per week, co-listed in Departments of Health Sciences and Technology and Aeronautics and Astronautics). Developed course syllabus, reading assignments for the semester, and term papers guidelines. Led class discussions, gave special topic lectures, and met with students individually during office hours. Provided feedback and graded term papers. Determined final course grades. Subject Evaluation Reports: overall course rating = 6.7/7 where 7 is best; my individual instructor rating = 6.7/7 ("stimulated interest" =

6.7//7, "displayed thorough knowledge of the subject material" = 7/7, "helped me learn" = 6.7/7).

2014, May 1 16.470/ESD.756: STATISTICAL METHODS IN EXPERIMENTAL DESIGN
Guest lecture on "Applying Statistics to Sports Analytics" to MIT Higher-level graduate course. Related how statistical methods taught in the course could be applied to analyzing sports using real-world, published examples. Contact: Professor Leia Stirling (MIT).

HONORS AND SOCIETIES

2016 Selected for the National Academies' Forum for New Leaders in Space Science
2016-2017 Served on the National Academies Committee to Review NASA's Evidence Reports on Human Health Risks
2016 – present Member of the American Institute of Aeronautics and Astronautics (AIAA)
2014 Stanley Roscoe Award for Best Doctoral Thesis (Aerospace Human Factors Association)
2013 – 2015 NSBRI First Award Fellowship Recipient
2013 – 2015 Member of NSBRI Society of Fellows
2013 MIT Aero-Astro Technical Communication Competition Finalist (2nd place)
2012 – 2013 MIT Aero-Astro Boeing Fellow
2011 – 2013 MIT Graduate Student Council Executive Committee
2008 – 2013 Charles Stark Draper Laboratory Fellow
2009 – 2010 Graduate Association of Aeronautics and Astronautics Executive Committee
2005 – 2008 Tau Beta Pi – Engineering Honor Society
2005 – 2008 Sigma Gamma Tau – Aerospace Honor Society

PEER REVIEWED JOURNAL PAPERS

1. Clark, T.K., Young, L.R., Stimpson, A.J., Duda, K.R., Oman C.M. "Numerical Simulation of Human Orientation perception during Lunar Landing" Acta Astronautica 2011, 69(7-8): 420-428. doi: 10.1016/j.actaastro.2011.04.016.

2. Clark, T.K., Stimpson, A.J., Young, L.R., Oman, C.M., Duda, K.R., Natapoff, A. "Human Spatial Orientation Perception during Simulated Lunar Landing Motions" AIAA Journal of Spacecraft and Rockets 2014, 51(1): 267-280. doi: 10.2514/1.A32493.

3. Clark, T.K., Newman, M.C., Oman, C.M., Merfeld, D.M., and Young, L.R. "Human Perceptual Overestimation of Whole-Body Roll Tilt in Hyper-Gravity" Journal of Neurophysiology 2015, 113(7): 2062-77. doi: 10.1152/jn.00095.2014.

4. Clark, T.K., Newman, M.C., Oman, C.M., Merfeld, D.M., and Young, L.R. "Human Manual Control Performance in Hyper-Gravity" Experimental Brain Research 2015, 233: 1409-1420. doi: 10.1007/s00221-015-4215-y.

5. Clark, T.K., Newman, M.C., Oman, C.M., Merfeld, D.M., and Young, L.R. "Modeling Human Dynamic Perception of Orientation in Altered Gravity" Frontiers in Systems Neuroscience Special Topic: A Multidisciplinary Approach to Designing Sensorimotor Adaptation Countermeasures for Space Exploration Missions 2015, 9. doi: 10.3389/fnsys.2015.00068.

6. Merfeld, D.M., Clark, T.K., Yue, L.M., and Karmali, F. "Dynamics of Individual Perceptual Decisions" Journal of Neurophysiology 2016, 115(1):39-59. doi: 10.1152/jn.00225.2015. Highlighted as "Featured Article" on the Journal of Neurophysiology homepage.

7. Bermudez Rey, M.C., Clark, T.K., Wang, W., Leeder, T., Bian, Y., Merfeld, D.M. "Vestibular Perceptual Thresholds Increase above the Age of 40" Frontiers in Neurology 2016, 7:162. Doi: 10.3389/fneur.2016.00162.

8. Diaz-Artiles, A., Priesol, A., Clark, T.K., Sherwood, D., Oman, C., Young, L.R., Karmali, F. "The Impact of Promethazine on Human Whole-Body Motion Perceptual Thresholds" Journal of the Association for Research in Otolaryngology 2017. Doi: 10.1007/s10162-017-0622-z.

9. Clark, T.K., Young, L.R. "A Case Study of Human Roll Tilt Perception in Hypogravity" Aerospace Medicine and Human Performance 2017, 88(7):682-687(6). Doi: 10.3357/AMHP.4823.2017.

10. Karmali, F., Bermudez-Rey, M.C., Clark, T.K., Wang, W., and Merfeld, D.M. "Multivariate Analyses of Balance Test Performance, Vestibular Thresholds, and Age" Frontiers in Neurology, 2017, 8:578. Doi: 10.3389/fneur.2017.00578.

11. Bermudez-Rey, M.C., **Clark, T.K.**, and Merfeld, D.M. "Balance Screening of Vestibular Function in Subjects Aged 4 Years and Older: A Living Laboratory Experience" Frontiers of Neurology, 2017, 8:631. Doi: 10.3389/fneur.2017.00631.

12. Clark, T.K., Yi, Y., Galvan-Garza, R.C., Bermudez Rey, M.C., and Merfeld, D.M. "When uncertain, does human self-motion decision-making utilize optimal or suboptimal inference?" Journal of Neurophysiology, 2018 (accepted Dec 20, 2017) Doi: 10.1152/jn.00680.2017.

BOOK CHAPTERS

1. Scott-Conner, C.E.H., Masys, D.R., Bailey, S.E., Bloomfield, S.A., Clark, T.K., Feinberg, A.P., Goel, N., Hei, T.K., Pawelczyk, J.A., Satcher, R.L.Jr., Stein, M.B., Turner, R.E., Yates, B.J. "Review of NASA's Evidence Reports on Human Health Risks: 2016 Letter Report" National Academies of Science Press 2017. Primarily contributed to review of the "Risk of Impaired Control of Spacecraft/Associated Systems and Decreased Mobility due to Vestibular/Sensorimotor Alterations Associated with Space Flight".

2. Merfeld, D.M., Clark, T.K. "Canal-Otolith Interactions" Reference Module in Neuroscience and Biobehavioral Psychology 978-0-08-045046-9.

PEER-REVIEWED CONFERENCE PAPERS

1. Clark, T.K., Krieg, M., Mohseni, K., "Flow Visualization for Pulsatile Vortex Ring Thrusters" ASME International Mechanical Engineering Congress and Exhibition, IMECE2008-68030, Boston, MA, 31 October – 6 Nov, 2008.

2. Clark, T.K., Klein, P., Lake, G., Lawrence-Simon, S., Moore, J., Rhea-Carver, B., Sotola, M., Wilson, S., Wolfskill, C., Wu, A. "KRAKEN: Kinematically Roving Autonomously Controlled Electro-Nautic" 47th AIAA Aerospace Sciences Meeting Including The New Horizons Forum and Aerospace Exposition, Orlando, FL, 5-8 Jan, 2009.

3. Clark, T.K., Stimpson, A.J., Young, L.R., Oman, C.M., Duda, K.R. "Analysis of Human Spatial Perception during Lunar Landing" IEEE/AIAA Aerospace Conference. Big Sky, MT, 6-13 Mar, 2010.

4. Young, L.R., Stimpson, A.J., Clark, T.K., Duda, K.R., Oman, C.M. "Sensorimotor Control and Displays for Safe and Precise Lunar Landing" 61st International Astronautical Congress. Prague, Czech Republic. 27 Sep – 1 Oct, 2010.

5. Stimpson, A.J., Clark, T.K., Young, L.R., Duda, K.R., Oman, C.M. "Effects of an Achievability Display during Simulated Lunar Landings" IEEE/AIAA Aerospace Conference. Big Sky, MT, 6-13 Mar, 2011.

6. Clark, T.K., Young, L.R., Duda, K.R., Oman, C.M. "Simulation of Astronaut Perception of Vehicle Orientation during Planetary Landing Trajectories" IEEE/AIAA Aerospace Conference. Big Sky, MT, 3-10 Mar, 2012.

7. Clark, T.K., Newman, M.C., Merfeld, D.M., and Young, L.R. "Pilot Control and Stabilization of a Rate-Controlled Vehicle in Hyper-Gravity" IEEE Aerospace Conference. Big Sky, MT, 1-8 Mar, 2014.

8. Karmali, F., Diaz, A. Galvan-Garza, R.C., Clark, T.K., Sherwood, D.P., Young, L.R. "Development of a Countermeasure to Enhance Sensorimotor Adaptation to Altered Gravity" IEEE Aerospace Conference, Big Sky, MT, 5-12 Mar, 2016.

9. Engle, J., Dharmaraj, R., and Clark, T.K., "Artificial Gravity for Low Earth Orbit (ISS) & Deep Space Exploration" AIAA SPACE Conference, Long Beach, CA, 13-16 Sep, 2016.

10. Young, L.R., Karmali, F., *Galvan-Garza, R.C.*, and Clark, T.K. "Changing Gravity Levels – Manual Control and Spatial Orientation Adaptation during Hypo-Gravity Centrifugation", 67th International Astronautics Congress, Mexico City, MX, 26-30 Sep, 2016.

11. Engle, J. and Clark, T.K. "An Approach for Development and Deployment of Artificial Gravity in Deep Space Exploration Architectures" AIAA Space Conference, Orlando, FL, 12-14 Sep, 2017.

12. *Seyedmadani, K., Vincent, G.*, Gruber, J.An., Gruber, J.Al., Cooper, V., and Clark, T.K. "The Linear Sled "Hybrid" Approach to Artificial Gravity as a Countermeasure for Crewed Long-Duration Space Exploration Missions" AIAA Space Conference, Orlando, FL, 12-14 Sep, 2017.

THESES

1. Clark, T.K., Human Spatial Orientation Perception during Simulated Lunar Landing. S.M. Thesis in Aeronautics and Astronautics, Massachusetts Institute of Technology: Cambridge, MA, 2010.

2. Clark, T.K., Human Perception and Control of Vehicle Roll Tilt in Hyper-Gravity. Ph.D. Thesis in Aeronautics and Astronautics, Massachusetts Institute of Technology: Cambridge, MA, 2013. Won **Stanley N. Roscoe Award for Best Doctoral Dissertation** in 2013-2014 for research related to aerospace human factors from the Aerospace Human Factors Association.

PRESENTATIONS

1. Duda, K.R., Young, L.R., Oman, C.M., Liu, A.M., Stimpson, A.J., and Clark T.K. "Evaluation of Sensorimotor Performance during Lunar Landing" (abstract) Aviation, Space, and Environmental Medicine, 80(3), Mar, 2009.

2. Duda, K.R., Young, L.R., Oman, C.M., Liu, A.M., Stimpson, A.J., and Clark, T.K. "Sensorimotor Displays and Controls to Enhance the Safety of Human/Machine Cooperation during Lunar Landing" The Aerospace Medical Association 80th Annual Scientific Meeting, Los Angeles, CA, 4 May, 2009.

3. Young, L.R., Duda, K.R., Clark, T.K., Stimpson, A.J., and Oman, C.M. "Sensorimotor Interaction with Vehicle Displays and Control to Enhance Human-Machine Cooperation during Precision Lunar Landing" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Houston, TX, 2-4 Feb, 2010.

4. Clark, T.K., Young, L.R., Stimpson, A.J., Duda, K.R., Oman, C.M., and Natapoff, A. "Astronaut Spatial Orientation Perceptions during Simulated Lunar Landing" (abstract and presentation) Journal of Vestibular Research Special Issue 2011, 21: 79, Eighth Symposium on the Role of the Vestibular Organs in Space Exploration, Houston, TX, 8-10 Apr, 2011.

5. Young, L.R., Oman, C.M. Clark, T.K. Tritchler, S.E., Duda, K.R., Wood, S.J., and Estrada, A. "Sensorimotor Interaction with Vehicle Displays and Controls to Enhance Human-Machine Cooperation during Precision Lunar Landing" (abstract and presentation), NASA Human Research Program Investigator's Workshop, Houston, TX, 13-16 Feb, 2012.

6. Young, L.R., Clark, T.K., Estrada, A. and Tritchler, S. "Lunar Dust Challenges to Astronaut Landing" (abstraction and presentation) Dust, Atmosphere, and Plasmas: Moon and Small Bodies Workshop, Boulder, CO, 6-8 Jun, 2012.

7. Young, L.R., Oman, C.M., Clark, T.K., Tritchler, S.E., Duda, K.R., Wood, S.J., and Estrada, A. "Sensorimotor Interaction with Vehicle Displays and Controls to Enhance Human-Machine Cooperation during Precision Lunar Landing: Project Review" (abstract and presentation), NASA Human Research Program Investigator's Workshop, Galveston, TX, 11-14 Feb, 2013.

8. Young, L.R., Beckers, N.W.M., Karmali, F., and Clark, T.K. "Countermeasures to Reduce Sensorimotor Impairment and Space Motion Sickness Results from Altered Gravity Levels" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 11-13 Feb, 2014.

9. Clark, T.K. "Predicting Sensorimotor Adaptation to Altered Gravity by Measuring Vestibular Perceptual Thresholds" (presentation) NSBRI Symposium: Designing for the Future: Remote Rehabilitation and Integration of New Technologies in Spaceflight, Houston, TX, 6-7 May, 2014.

10. Clark, T.K. "Predicting Sensorimotor Adaptation to Altered Gravity by Measuring Vestibular Perceptual Thresholds" (presentation) NSBRI Summer Bioastronautics Institute, invited lecture, Houston, TX, 29 May, 2014.

11. Clark, T.K. "Why we aren't designed for space: the physiological and psychological challenges of humans living in space and what can be done about them" (presentation) Space Nerds of Boston, invited lecture, Boston, MA, 30 Sep, 2014.

12. Hackler, A.S., Deymier-Black, A., Clark, T.K., Lawley, J., Simon, J., Bokhari, R., LaPelusa, M., and McNeel, R. "Innovation by a New NSBRI Generation" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 13-15 Jan, 2015.

13. Diaz, A., Beckers, N.W.M., Clark, T.K., Sherwood, D., Oman, C., Young, L.R., and Karmali, F. "Development of a Countermeasure to Enhance Sensorimotor Adaptation to Altered Gravity Levels" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 13-15 Jan, 2015.

14. Diaz, A., Clark, T.K., Sherwood, D., Galvan-Garza, R.C., Beckers, N.W.M., Natapoff, A., Oman, C.M., Young, L.R., and Karmali, F. "Development of a Countermeasure to Enhance Sensorimotor Adaptation to Altered Gravity Levels" (presentation) NSBRI Symposium: Towards Integrated Countermeasures for Deep Space Exploration: Vestibular Function for Balance and Beyond, Houston, TX, 7-8 May, 2015.

15. Clark, T.K. "Predicting Individual Differences in Sensorimotor Adaptability to Altered Gravity using Measures of Sensory Noise: Validation and Operation Considerations" (presentation) NSBRI Symposium: Towards Integrated Countermeasures for Deep Space Exploration: Vestibular Function for Balance and Beyond, Houston, TX, 7-8 May, 2015.

16. Mulavara, A.P., De Dios, Y.E., Gadd, N.E., Caldwell, E.E., Batson, C.D., Goel, R., Seidler, R.D., Oddsson, L., Zanello, S., Clark, T.K., Peters, B., Cohen, H.S., Reschke, M., Wood, S., and Bloomberg, J.J. "Behavioral, Brain Imaging and Genomic Measures to Predict Functional Outcomes Post-Bed Rest and Spaceflight" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 8-11 Feb, 2016.

17. Karmali, F., Galvan-Garza, R.C., Sherwood, D., Rosenberg, M.J.F., Clark, T.K., Oman, C., and Young, L.R. "Development of a Countermeasure to Enhance Sensorimotor Adaptation to Altered Gravity Levels" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 8-11 Feb, 2016.

18. Young, L.R., and Clark, T.K. "The Human Pilot – Physiology and Manual Control in Space" (presentation) NSBRI Human Factors and Performance Team Focused Scientific Meeting – Piloting Spacecraft: Guidance and Control of Human Space Vehicles, Houston, TX, 21-22 Sep, 2016.

19. Vincent, G., Gruber, J., Reed, B., Newman, M.C., and Clark, T.K., "Observer Model Analysis of Orientation Perception during Artificial Gravity Stimulation via Centrifugation versus Linear Sled" (abstract and presentation) 32nd American Society for Gravitational and Space Research Conference, Cleveland, OH, 26-29 Oct, 2016.

20. Mulavara, A.P., Peters, B., De Dios, Y.E., Gadd, N.E., Caldwell, E.E., Batson, C.D., Goel, R., Oddsson, L., Kreutzberg, G., Zanello, S., Clark, T.K., Oman, C.M., Cohen, H.S., Wood, S., Seidler, R.D., Reschke, M., and Bloomberg, J.J. "Behavioral, Brain Imaging and Genomic Measures to Predict Functional Outcomes Post-Bed Rest and Spaceflight" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 23-26 Jan, 2017.

21. Young, L.R., Karmali, F., Galvan-Garza, R.C., Rosenberg, M.J.F, Artiles, A.D., Oman, C.M., Sherwood, D., Natapoff, A., Kenyon, R., and Clark, T.K. "Spatial Orientation and Manual Control in Reduced Gravity" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 23-26 Jan, 2017.

22. *McCusker, A., Bretl, K., Dixon, A.*, and Clark, T.K. "A Protocol to Eliminate the Cross-Coupled Illusion during Centrifuge Artificial Gravity" (abstract and presentation) Aerospace Medical Association 88th Annual Scientific Meeting, Denver, CO, 30 Apr-4 May, 2017.

23. Clark, T.K., *Seyedmadani, K.*, and Gruber J. "Turbolift – A Linear Sled Hybrid Approach to Artificial Gravity" (presentation) NASA Innovative and Advanced Concepts Symposium, Denver, CO, 25-27 Sept, 2017.

24. Clark, T.K. "Human Perception of Orientation in Hyper-Gravity: Experiments and Modeling" (presentation) T32 Research Seminar Series, University of Colorado Anschutz Medical Campus, Aurora, CO, 28 Sept, 2017.

25. Clark, T.K. "Human Perception of Orientation in Hyper-Gravity" (presentation) Invited research lecture, Wright-Patterson Air Force Base, Naval Medical Research Unit, Dayton, OH, 20 Nov, 2017.

26. Clark, T.K. "Human Perception of Orientation in Altered Gravity" (presentation) Invited research presentation, Front Range Neuroscience, Fort Collins, CO, 6 Dec, 2017.

27. Clark, T.K. and Young, L.R. "Reduced Ocular Torsion and Tilt Perception in Hypo-Gravity" (abstract and presentation) Next-Generation Suborbital Researchers Conference, Broomfield, CO, 18-20, Dec, 2017.

28. Mulavara, A.P., Peters, B., De Dios, Y.E., Gadd, N.E., Caldwell, E.E., Batson, C.D., Goel, R., Oddsson, L., Kreutzberg, G., Zanello, S., **Clark, T.K.**, Waddington, G., Oman, C.M., Cohen, H.S., Wood, S., Seidler, R.D., Reschke, M.F., and Bloomberg, J.J. "Behavioral, Brain Imaging and Genomic Measures to Predict Functional Outcomes Post-Bed Rest and Spaceflight" (abstract and presentation) NASA Human Research Program Investigator's Workshop, Galveston, TX, 22-25 Jan, 2018.

ABSTRACTS / POSTERS

1. Young, L.R., Duda, K.R., Oman C.M., Wood, S., Estrada, A., Clark, T.K., Stimpson, A.J., and Mateus, J. "Two Spatial Disorientation Projects: Artificial Gravity and Lunar Landing" (abstract and poster) NASA Human Research Program Investigators' Workshop. League City, TX, 2-4 Feb, 2009.

2. Young, L.R., Duda, K.R., Oman, C.M., Liu, A.M., Stimpson A.J., and Clark, T.K. "Critical Factors Affecting Lunar Landing Supervisory Control Performance" (abstract) 60th International Astronautical Congress, Daejong, Korea, 12-16 Oct, 2009.

3. Newman, M.C., Oman, C.M., Clark, T.K., Mateus, J., and Kaderka, J.D. "Pseudo-Coriolis Effect: A 3D Angular Velocity Phenomenon Described by a Left-Hand Rule" (abstract and presentation) Journal of Vestibular Research Special Issue 2011, 21: 70-71, Eighth Symposium on the Role of the Vestibular Organs in Space Exploration, Houston, TX, 8-10 Apr, 2011.

4. Stimpson, A.J., Young, L.R., Clark, T.K., Duda, K.R., and Oman, C.M. "Effects of an Achievability Display on Pilot Decision Making and Behavior in Simulated Lunar Landings" (abstract and poster) 18th IAA Humans in Space Symposium, Houston, TX, 11-15 Apr, 2011.

5. Clark, T.K. and Newman M.C., "Human Perception of Roll Tilt in Hyper-Gravity" (abstract and poster) NASA Human Research Program Investigator's Workshop, Houston, TX, 13-16 Feb, 2012.

6. Clark, T.K. and Newman M.C. “Human Perception of Roll Tilt in Hyper-Gravity” (abstract and poster) NASA Human Research Program Investigator’s Workshop, Galveston, TX, 11-14 Feb, 2013. Poster selected as a NSBRI Dr. David Watson Student Fellow Poster Award Winner.

7. Galvan, R.C., Bloomberg, J.J., Mulavara, A.P., Clark T.K., Merfeld, D.M., and Oman, C.M. “Improving Sensorimotor Function and Adaptation using Stochastic Vestibular Stimulation” (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 11-13 Feb, 2014.

8. Beckers, N.W.M., Young, L.R., Karmali, F., and Clark, T.K. “Studying the Innate Capacity for Sensorimotor Adaptation to Altered Gravity Levels” (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 11-13 Feb, 2014.

9. Clark, T.K. and Newman, M.C. “Human Manual Control of Vehicle Roll Tilt in Hyper-Gravity” (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 11-13 Feb, 2014.

10. Newman, M.C. and Clark, T.K. “Methods for Studying Human Orientation Perception and Control in Hyper-Gravity” (abstract and poster) Aerospace Medical Association (AsMA) 85th Annual Scientific Meeting, San Diego, May 5-10, 2014.

11. Clark, T.K., Newman, M.C., Oman, C.M., Merfeld, D.M., and Young, L.R. “Human Perception of Roll Tilt in Hyper-Gravity: Experiments and Modeling” (abstract and poster) XXVIIIth Barany Society Meeting, Buenos Aires, Argentina, 25-28 May, 2014.

12. Clark, T.K., Yi, Y., Galvan-Garza, R. Bermudez Rey, M.C., and Merfeld D.M. “How Many Decision Boundaries Contribute to Human Vestibular Decisions?” (abstract and poster) Society for Neuroscience Meeting, Washington, D.C., 15-19 Nov, 2014.

13. Galvan, R.C., Clark, T.K., Merfeld, D.M., Bloomberg, J.J., Mulavara, A.P., and Oman, C.M. “Improving Sensorimotor Function using Stochastic Vestibular Stimulation” (abstract and poster) NASA Human Research Program Investigator’s Workshop, Galveston, TX, 13-15 Jan, 2015.

14. Clark T.K., Newman, M.C., Oman, C.M., Merfeld, D.M., and Young, L.R. “Modeling Human Orientation Perception in Altered Gravity” (abstract and poster) NASA Human Research Program Investigator’s Workshop, Galveston, TX, 13-15 Jan, 2015.

15. Clark, T.K., Galvan-Garza, R.C., Bermudez Rey, M.C., Yi, Y., and Merfeld, D.M. “Perceptual Noise and Sensorimotor Adaptation” (abstract and poster) NASA Human Research Program Investigator’s Workshop, Galveston, TX, 13-15 Jan, 2015.

16. Galvan-Garza, R.C., Clark, T.K., Merfeld, D.M., Bloomberg, J.J., Oman, C.M., and Mulavara, A.P. “Exhibition of Stochastic Resonance in Vestibular Perception” (abstract and poster) NASA Human Research Program Investigator’s Workshop, Galveston, TX, 8-11 Feb, 2016.

17. Rosenberg, M.J.F., Galvan-Garza, R.C., Clark, T.K., Sherwood, D.P., Young, L.R., and Karmali, F. “Sensory Precision Limits Vehicle Control Performance” (abstract and poster) NASA Human Research Program Investigator’s Workshop, Galveston, TX, 8-11 Feb, 2016.

18. Clark, T.K., Peters, B.T., Gadd, N.E., De Dios, Y.E., Wood, S.J., Bloomberg, J.J., Oman, C.M., and Mulavara, A.P. "Relationships between Vestibular Measures as Potential Predictors for Spaceflight Sensorimotor Adaptation" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 8-11 Feb, 2016.

19. Clark, T.K. and Merfeld, D.M. "Vestibular Perceptual Noise and Adaptation to an Altered Gravity Environment" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 8-11 Feb, 2016.

20. Rosenberg, M.J.F., Galvan-Garza, R.C., Clark, T.K., Sherwood, D.P., Young, L.R., and Karmali, F. "Sensory Precision Limits Behavioral Precision in a Manual Control Task" (abstract and poster) Society for Neuroscience Meeting, San Diego, CA, 12-16 Nov, 2016.

21. Clark, T.K. and Merfeld, D.M. "Does Adaptation to Tilt Perception to Altered Gravity Relate to Vestibular Perceptual Thresholds?" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 23-26 Jan, 2017.

22. Dixon, J.B., Rafii, A.L., Bretl, K.N., and Clark, T.K. "A Ground-based Analog for Microgravity-Induced Sensorimotor Reinterpretation: Wheelchair Head Immobilization Paradigm" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 23-26 Jan, 2017.

23. Bretl, K.N., McCusker, A.T., Dixon J.B., and Clark, T.K. "Human Adaptation to the Coriolis Cross-Coupled Illusion for Artificial Gravity" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 23-26 Jan, 2017.

24. Gruber, J.An., Seyedmadani, K., Vincent, G., Reed, B., Gruber, J.Al., and Clark, T.K. "A Novel Linear Sled "Hybrid" Artificial Gravity Countermeasure for Microgravity-Induced Physiological Deconditioning" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 23-26 Jan, 2017.

25. *Zuzula, E., Dixon, J., Bretl, K.,* and **Clark, T.K.** "Design and Development of an Algorithm for an Achievability Limit Display for Crewed Planetary Landing" (abstract and poster) Aerospace Medical Association 88th Annual Scientific Meeting, Denver, CO, 30 Apr-4 May, 2017.

26. *Dixon, J.B.,* and **Clark, T.K.** "Preliminary Validation of the Wheelchair Head Immobilization Paradigm as an Analog for Post-flight Sensorimotor Impairment" (abstract and poster, **won 1st place in the student poster competition**) NASA Human Research Program Investigator's Workshop, Galveston, TX, 22-25, Jan, 2018.

27. *Seyedmadani, K.,* Gruber, J.A., *Vincent, G.,* and **Clark, T.K.** "Linear Sled-Hybrid Artificial Gravity as a Comprehensive Countermeasure for Astronaut Physiological Deconditioning" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 22-25, Jan, 2018.

28. *Bretl, K.N., Sherman, S.O., Mitchell, T.R., Dixon, J.B.,* and **Clark, T.K.** "Personalized and Non-Personalized Protocols for Human Adaptation to the Coriolis Cross-Coupled Illusion for Artificial Gravity" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 22-25, Jan, 2018.

29. *Pinedo, C., Dixon, J.B., Davis, E., Zuzula, E.,* and **Clark, T.K.** "A Numerical Algorithm to Estimate an Achievability Limit for Crewed Planetary Landing" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 22-25, Jan, 2018.

30. Anderson, A.P., *Butterfield, J.*, Subramanian, P., and **Clark, T.K.** "Artificial Gravity as a Countermeasure for Spaceflight Associated Neuro-Ocular Syndrome" (abstract and poster) NASA Human Research Program Investigator's Workshop, Galveston, TX, 22-25, Jan, 2018.