

Associate Professor, Department of Otolaryngology – Head & Neck Surgery (on leave 2013-2016)  
 Associate Professor, Department of Biomedical Engineering  
 The Johns Hopkins University, School of Medicine  
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Chief Scientist, NASA Human Research Program (2013-2016)  
 NASA Johnson Space Center  
 Houston TX 77058  
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**Education and Training:**

B.S.	1982	Drexel University, Philadelphia PA	Electrical Engineering
M.S.	1982	Drexel University, Philadelphia PA	Electrical Engineering
Sc.D.	1990	M.I.T., Cambridge MA	Biomedical Engineering
PostDoc	1992	Johns Hopkins University	Ophthalmology/BME

**Professional Experience:**

<b>Laboratory Technician</b>	Drexel University Philadelphia PA	1978-1979
<b>Research Assistant</b>	Ultrasonics International, Inc. Trevose PA	1979-1980
<b>Laboratory Technician</b>	Temple University School of Medicine Philadelphia PA	1980-1982
<b>Volunteer Instructor</b>	NASA Life Sciences Training Program Kennedy Space Center FL	1985
<b>Research Assistant</b>	Man-Vehicle Laboratory MIT, Cambridge MA	1982-1990
<b>Postdoctoral Fellow</b>	Department of Ophthalmology Johns Hopkins University School of Medicine	1990-1992
<b>Research Associate</b>	Department of Biomedical Engineering Johns Hopkins University School of Medicine	1992-1994
<b>Assistant Professor</b>	Department of Otolaryngology - Head & Neck Surgery Johns Hopkins University School of Medicine	1994-2002
<b>Assistant Professor</b>	Department of Biomedical Engineering Johns Hopkins University School of Medicine	1994-2002
<b>Associate Professor</b>	Department of Otolaryngology - Head & Neck Surgery Johns Hopkins University School of Medicine	2002-present (on leave)
<b>Associate Professor</b>	Department of Biomedical Engineering Johns Hopkins University School of Medicine	2002-present (on leave)
<b>Chief Scientist</b>	NASA Human Research Program Johnson Space Center, Houston TX	2013-present

**RESEARCH ACTIVITIES****Peer-reviewed Original Science Research:**

1. Young LR, **Shelhamer M**, Modestino S. M.I.T./Canadian vestibular experiments on the Spacelab-1 mission: 2. Visual vestibular tilt interaction in weightlessness. *Exp Brain Res*, 1986, 64:299-307.
2. Young LR, **Shelhamer M**. Microgravity enhances the relative contribution of visually-induced self motion sensation. *Aviat Space Environ Med*, 1990, 61:525-530.
3. **Shelhamer M**, Robinson DA, Tan S. Context-specific gain switching in the human vestibuloocular reflex. *Ann NY Acad Sci*, 1992, 656:889-891.
4. Tan S, **Shelhamer M**, Zee DS. Effect of head orientation and position on vestibuloocular reflex adaptation. *Ann NY Acad Sci*, 1992, 656:158-165.

5. **Shelhamer M**, Zee DS, Herdman SJ. Observations on horizontal, vertical, and oblique saccades with head tilt. *Invest Ophthalmol Vis Sci*, 1992, 33:1154.
6. **Shelhamer M**, Robinson DA, Tan S. Context-specific adaptation of the gain of the vestibulo-ocular reflex in humans. *J Vestibular Res*, 1992, 2:89-96.
7. **Shelhamer M**. Correlation dimension of optokinetic nystagmus as evidence of chaos in the oculomotor system. *IEEE Trans Biomed Eng*, 1992, 39:1319-1321.
8. Merfeld DM, Young LR, Oman CM, **Shelhamer MJ**. A multi-dimensional model of the effect of gravity on the spatial orientation of the monkey. *J Vestibular Res*, 1993, 3:141-161.
9. Tiliket C, **Shelhamer M**, Tan HS, Zee DS. Adaptation of the vestibulo-ocular reflex with the head in different orientations and positions relative to the axis of body rotation. *J Vestibular Res*, 1993, 3:181-195.
10. **Shelhamer M**, Young LR. The interaction of otolith organ stimulation and smooth pursuit tracking. *J Vestibular Res*, 1994, 4:1-15.
11. Tiliket C, **Shelhamer M**, Roberts D, Zee DS. Short-term vestibulo-ocular reflex (VOR) adaptation in humans. I. Effect on the ocular motor velocity-to-position neural integrator. *Exp Brain Res*, 1994, 100:316-327.
12. **Shelhamer M**, Tiliket C, Roberts D, Kramer PD, Zee DS. Short-term vestibulo-ocular reflex (VOR) adaptation in humans. II. Error signals. *Exp Brain Res*, 1994, 100:328-336.
13. **Shelhamer M**, Merfeld DM, Mendoza JC. Vergence can be controlled by audio feedback, and induces downward ocular deviation. *Exp Brain Res*, 1994, 101:169-172.
14. **Shelhamer M**, Merfeld DM, Mendoza JC. Effect of vergence on the gain of the linear vestibulo-ocular reflex. *Acta Otolaryngol*, 1995, Supplement 520:72-76.
15. Kramer PD, **Shelhamer M**, Zee DS. Short-term adaptation of the phase of the vestibuloocular reflex (VOR) in normal human subjects. *Exp Brain Res*, 1995, 106:318-326.
16. **Shelhamer M**. On the correlation dimension of optokinetic nystagmus eye movements: computational parameters, filtering, nonstationarity, and surrogate data. *Biol Cybern*, 1997, 76:237-250.
17. McGuire G, Azar NB, **Shelhamer M**. Recurrence matrices and the preservation of dynamical properties. *Phys Lett A*, 1997, 237:43-47.
18. Kramer P, **Shelhamer M**, Zee DS. Short-term vestibulo-ocular adaptation: influence of context. *Otolaryngol – Head Neck Surg*, 1998, 119:60-64.
19. Kramer PD, Roberts DC, **Shelhamer M**, Zee DS. A versatile stereoscopic visual display for vestibular and oculomotor research. *J Vestibular Res*, 1998, 8:363-379.
20. Kramer PD, **Shelhamer M**, Peng GCY, Zee DS. Context-specific short-term adaptation of the phase of the vestibulo-ocular reflex (VOR). *Exp Brain Res*, 1998, 120:184-192.
21. **Shelhamer M**, Gross CD. Prediction of the sequence of optokinetic nystagmus eye movements reveals deterministic structure in reflexive oculomotor behavior. *IEEE Trans Biomed Eng*, 1998, 45:668-670.
22. **Shelhamer M**. Nonlinear dynamic systems evaluation of 'rhythmic' eye movements (optokinetic nystagmus). *J Neurosci Methods*, 1998, 83:45-56.
23. Hegemann S, **Shelhamer MJ**, Zee DS. Phase adaptation of the linear vestibulo-ocular reflex. *Ann NY Acad Sci*, 1999, 871:414-416.
24. Hegemann S, **Shelhamer M**, Kramer PD, Zee DS. Adaptation of the phase of the human linear vestibulo-ocular reflex (LVOR) and effects on the oculomotor neural integrator. *J Vestibular Res*, 2000, 10:239-247.
25. **Shelhamer M**, Roberts DC, Kramer PD, Zee DS. Dynamics of the human linear vestibulo-ocular reflex at medium frequency and modification by short-term training. *J Vestibular Res*, 2000, 10:271-282.
26. **Shelhamer M**. Use of a genetic algorithm for the analysis of eye movements from the linear vestibulo-ocular reflex. *Ann Biomed Eng*, 2001, 29:510-522.
27. Trillenber P, Gross C, **Shelhamer M**. Random walks, random sequences, and nonlinear dynamics in human optokinetic nystagmus. *J App Physiol*, 2001, 91:1750-1759.
28. **Shelhamer M**, Zalewski S. A new application for time-delay reconstruction: detection of fast-phase eye movements. *Phys Lett A*, 2001, 291:349-354.
29. Trillenber P, Zee DS, **Shelhamer M**. On the distribution of fast phase intervals in OKN and VOR. *Biol Cybern*, 2002, 87:68-78.
30. **Shelhamer M**, Peng GCY, Ramat S, Patel V. Context-specific adaptation of the oculomotor response to lateral translation using roll and pitch head tilts as contexts. *Exp Brain Res*, 2002, 146:388-393.
31. **Shelhamer M**, Clendaniel RA. Context-specific adaptation of saccade gain. *Exp Brain Res*, 2002, 146:441-450.
32. **Shelhamer M**, Clendaniel R. Sensory, motor, and combined contexts for context-specific adaptation of saccade gain in humans. *Neurosci Lett*, 2002, 332:200-204.
33. Eggers SDZ, De Pennington N, Walker MF, **Shelhamer M**, Zee DS. Short-term adaptation of the VOR: non-retinal-slip error signals and saccade substitution. *Ann NY Acad Sci*, 2003, 1004:94-110.

34. Trillenber P, **Shelhamer M**, Roberts DC, Zee DS. Cross-axis adaptation of torsional components in the yaw-axis VOR. *Exp Brain Res*, 2003, 148:158–165.
35. **Shelhamer M**, Clendaniel RA, Roberts DC. Context-specific adaptation of saccade gain in parabolic flight. *J Vestibular Res*, 2003, 12:211-221.
36. **Shelhamer M**, Joiner W. Saccades exhibit abrupt transition between reactive and predictive, predictive saccade sequences have long-term correlations. *J Neurophysiol*, 2003, 90:2763-2769.
37. Walker MF, **Shelhamer M**, Zee DS. Eye-position dependence of torsional velocity during interaural translation, horizontal pursuit, and yaw-axis rotation in humans. *Vision Res*, 2004, 44:613-620.
38. **Shelhamer M**, Zee DS. Context-specific adaptation and its significance for neurovestibular problems of space flight. *J Vestibular Res*, 2004, 13:345-362.
39. Aboukhalil A, **Shelhamer M**, Clendaniel R. Acquisition of context-specific adaptation is enhanced with rest intervals between changes in context state, suggesting a new form of motor consolidation. *Neurosci Lett*, 2004, 369:162-167.
40. Karmali F, **Shelhamer M**. Automatic detection of camera translation in eye video recordings using multiple methods. *Ann NY Acad Sci*, 2005, 1039:470-476.
41. Joiner WM, **Shelhamer M**, Ying YH. Cerebellar influence in oculomotor phase-transition behavior. *Ann NY Acad Sci*, 2005, 1039:536-539.
42. **Shelhamer M**, Aboukhalil A, Clendaniel R. Context-specific adaptation of saccade gain is enhanced with rest intervals between changes in context state. *Ann NY Acad Sci*, 2005, 1039:166-175.
43. **Shelhamer M**. Sequences of predictive saccades are correlated over a span of ~2 s and produce a fractal time series. *J Neurophysiol*, 2005, 93:2002-2011.
44. **Shelhamer M**. Phase transition between reactive and predictive eye movements is confirmed with nonlinear forecasting and surrogates. *Neurocomp*, 2005, 65-66:769-776.
45. **Shelhamer M**. Sequences of predictive eye movements form a fractional Brownian series - implications for self-organized criticality in the oculomotor system. *Biol Cybern*, 2005, 93:43-53.
46. Joiner WM, **Shelhamer M**. Pursuit and saccadic tracking exhibit a similar dependence on movement preparation time. *Exp Brain Res*, 2006, 173:572-586.
47. Joiner WM, **Shelhamer M**. An internal clock generates repetitive predictive saccades. *Exp Brain Res*, 2006, 175:305-320.
48. Joiner WM, **Shelhamer M**. Responses to noisy periodic stimuli reveal properties of a neural predictor. *J Neurophysiol*, 2006, 96:2121-2126.
49. Karmali F, Ramat S, **Shelhamer M**. Vertical skew due to changes in gravito-inertial force: a possible consequence of otolith asymmetry. *J Vestibular Res*, 2006, 16:117-125.
50. Zorn A, Joiner WM, Lasker AG, **Shelhamer M**. Sensory versus motor information in the control of predictive saccade timing. *Exp Brain Res*, 2007, 179:505-515.
51. Joiner WM, Lee JE, Lasker A, **Shelhamer M**. An internal clock for predictive saccades is established identically by auditory or visual information. *Vision Res*, 2007, 47:1645-1654.
52. Joiner WM, Lee JE, **Shelhamer M**. Behavioral analysis of predictive saccade tracking as studied by countermanding. *Exp Brain Res*, 2007, 181:307-320.
53. Roberts D, **Shelhamer M**, Wong A. A new “wireless” search-coil system. Proceedings of the Eye Tracking Research & Applications Symposium, Savannah, Georgia, March 26–28, 2008, pp. 197-204.
54. Schubert MC, Della Santina CC, **Shelhamer M**. Incremental angular vestibulo-ocular reflex adaptation to active head rotation. *Exp Brain Res*, 2008, 191:435-446.
55. Karmali F, **Shelhamer M**. The dynamics of parabolic flight: flight characteristics and passenger percepts. *Acta Astronaut*, 2008, 63:594-602.
56. Karmali F, **Shelhamer M**. Compensating for camera translation in video eye movement recordings by tracking a representative landmark selected automatically by a genetic algorithm. *J Neurosci Meth*, 2009, 176:157-165.
57. Joiner WM, **Shelhamer M**. A model of time estimation and error feedback in predictive timing behavior. *J Comp Neurosci*, 2009, 26:119-138.
58. Karmali F, **Shelhamer M**. Neurovestibular considerations for sub-orbital space flight: a framework for future investigation. *J Vestibular Res*, 2010, 20:31-43.
59. Scherer MR, **Shelhamer MJ**, Schubert MC. Characterizing high-velocity angular vestibulo-ocular reflex function in service members post-blast exposure. *Exp Brain Res*, 2010, 208:399-410.
60. **Shelhamer M**, Beaton K. Mission to Mars: training and maintenance of sensorimotor responses: considerations based on context-specific adaptation. *J Cosmology*, 2010, 12:3817-3824.
61. Wong AL, **Shelhamer M**. Sensorimotor adaptation error signals are derived from realistic predictions of movement outcomes. *J Neurophysiol*, 2011, 105:1130-1140.
62. Wong AL, **Shelhamer M**. Saccade adaptation improves in response to a gradually introduced stimulus perturbation. *Neurosci Lett*, 2011, 500:207-211.

63. Wong AL, **Shelhamer M**. Exploring the fundamental dynamics of error-based motor learning using a stationary predictive-saccade task. *PLoS ONE*, 2011, 6:e25225.
64. Arthur JC, Kortte KB, **Shelhamer M**, Schubert MC. Linear path integration deficits in patients with abnormal vestibular afference. *Seeing and Perceiving*, 2012, 25:155-178.
65. Wong AL, **Shelhamer M**. Using prediction errors to drive saccade adaptation: the implicit double-step task. *Exp Brain Res*, 2012, 222:55-64.
66. **Shelhamer M**, Beaton K. Pre-flight sensorimotor adaptation protocols for suborbital flight. *J Vestibular Res*, 2012, 22:139-144.
67. Wong AL, **Shelhamer M**. A long-memory model of motor learning in the saccadic system: a regime-switching approach. *Ann Biomed Eng*, 2013, 41:1613-1624.
68. Wong AL, **Shelhamer M**. Similarities in error processing establish a link between saccade prediction at baseline and adaptation performance. *J Neurophysiol*, 2014, 111:2084-2093.
69. **Shelhamer M**. Life-sciences research opportunities in commercial suborbital space flight. *Acta Astronautica*, 2014, 104:432-437.
70. **Shelhamer M**. Trends in sensorimotor research and countermeasures for exploration-class space flights. *Front Syst Neurosci*, 2015, 9:115.
71. **Shelhamer M**. A call for research to assess and promote functional resilience in astronaut crews. *J App Physiol* (in press).

#### **Patents:**

MJ Shelhamer, DC Roberts (issued June 2011) Wireless scleral search coil including systems for measuring eye movement and methods related thereto. U.S. Patent 7,967,439.  
 MJ Shelhamer (issued July 2015) Apparatus and method for assessing vestibulo-ocular function. U.S. Patent 9,072,481.

#### **Book:**

1. **Shelhamer M**. *Nonlinear Dynamics in Physiology: A State-Space Approach*. Singapore: World Scientific, 2007.

## **ORGANIZATIONAL ACTIVITIES**

### **Institutional Administrative Appointments**

JHU Space Studies Initiative Study Group, developing a plan for a university-wide space-studies program, including space life sciences (2008-2011)  
 Johns Hopkins Traumatology Group (2008-2009)  
 JHU Biomedical Engineering doctoral admissions committee (2011-2013)

### **Editorial Activities**

Editor: Special issue of *Nonlinear Dynamics in Psychology and Life Sciences* (2009)

#### Editorial Board appointments

*Nonlinear Dynamics in Psychology and Life Sciences* (2011- )  
*npj Microgravity* (2015- )

#### Journal peer review activities

*Annals of Biomedical Engineering*  
*Annals of Neurology*  
*Archives of Ophthalmology*  
*Archives of Otolaryngology – Head & Neck Surgery*  
*Attention, Perception, and Psychophysics*  
*Aviation, Space and Environmental Medicine*  
*Behavioural Brain Research*  
*Binocular Vision & Strabismus Quarterly*  
*Biological Cybernetics*

*Brain*  
*Experimental Brain Research*  
*IEEE Potentials*  
*IEEE Transactions on Biomedical Engineering*  
*Journal of the Neurological Sciences*  
*Journal of Neurophysiology*  
*Journal of Neuroscience*  
*Journal of Neuroscience Methods*  
*Journal of Physiology*  
*Journal of Vestibular Research*  
*Journal of Vision*  
*Neurology, Neuropsychologia*  
*Neurorehabilitation and Neural Repair*  
*Neuroscience Letters*  
*Nonlinear Dynamics in Psychology and Life Sciences*  
*Optometry & Vision Science*  
*Otology & Neurotology*  
*Physics Letters A*  
*Physiological Measurement*  
*PLOS ONE*  
*Psychonomic Bulletin & Review*  
*Vision Research*

### **Advisory Committees, Review Groups/Study Sections**

NASA Neurolab grant review panel (1994)  
NIH Special Emphasis Panel (1997-2000)  
NASA Neurobiology grant review panel (2000-2002)  
NIH Communication Disorders Review Committee, ad hoc reviewer (2000)  
NSF grant review panel (2003), ad hoc reviewer  
NIH/NIBIB site visit panel for USC project grant (2003, 2008)  
DoD/AIBS ad hoc reviewer  
NIH Special Emphasis Panel: Clinical Neurophysiology, Devices, Auditory Devices and Neuroprosthesis Small Business (2009-2012)  
NSBRI fellowship review panel (2011)

### **Professional Societies**

Institute of Electrical and Electronics Engineers (IEEE), Senior Member  
IEEE Engineering in Medicine and Biology Society  
IEEE Acoustics, Speech, and Signal Processing Society  
Society for Neuroscience  
Society for Chaos Theory in Psychology and Life Sciences

### **Conference Organizer, Session Chair**

July 2004

Clinical and Basic Ocular Motor Research, sponsored by the University of Siena, Italy. Session chair.

April – May, 2008

Neural Control of Movement annual meeting. Organizer of poster cluster on prediction and adaptation in the saccadic system.

April 2011

Symposium on the Role of the Vestibular Organs in Space Exploration. Sponsored by NASA/NSBRI. Program Committee and session chair.

April 2011

Humans in Space Symposium. Sponsored by the International Academy of Astronautics. Organized and chaired information session on suborbital research.

February 2010

Next-generation Suborbital Researchers Conference, sponsored by the Commercial Spaceflight Federation. Program Committee and chair of life-sciences session.

February – March 2011

Next-generation Suborbital Researchers Conference, sponsored by the Commercial Spaceflight Federation. Program Committee and chair of life-sciences session.

April 2011

8<sup>th</sup> Symposium on the Role of the Vestibular Organs in Space Exploration. Organizer and chair of suborbital spaceflight session.

February 2012

Next-generation Suborbital Researchers Conference, sponsored by the Commercial Spaceflight Federation. Program Committee and chair of life-sciences session and special session on parabolic flight.

May 2015

Aerospace Medical Association Annual Meeting. Co-chair of human space research session.

February 2014, January 2015, February 2016

Human Research Program Investigators Workshop

Chair of steering committee, present opening and closing talks and plenary on program status, introduce keynote speakers.

May 2016

Aerospace Medical Association Annual Meeting. Co-chair of artificial gravity session.

## **Consultantships**

Health Research Council of New Zealand (1992) ad hoc written grant reviewer

University of Sydney (1993) ad hoc written dissertation reviewer

Israel Science Foundation (1993) ad hoc written grant reviewer

NASA/NSBRI Workshop on Human Vestibular Adaptation (1999)

NASA Artificial Gravity Workshop (1999)

NASA Neurovestibular Integrated Product Team (IPT): liaison between research community and NASA medical operations personnel (flight surgeons) (1999-2002)

NASA Clinical Status Evaluation working group (2004)

Commercial Spaceflight Federation (CSF) – Suborbital Applications Researchers Group (2009- )

Army SBIR advisory panel – Tactual Sway Biofeedback (2010)

Army advisory panel, Noninvasive Neuroassessment Devices (2015- )

## **RECOGNITION**

### **Awards, honors:**

NSF Graduate Fellowship (1982-1985)

NASA Group Achievement Award, for Life Sciences Experiments on Spacelab-1 (1984)

Whitaker Health Sciences Fund Fellowship (1986-1988)

Award for outstanding contributions to the MIT Man-Vehicle Laboratory (1989)

Senior Member, IEEE (2007)

Best paper award, Eye Tracking Research and Applications meeting (2008)

NASA JSC “On the Spot” Award, for work on reducing ISS crew time requirements (2015)

### **Invited talks, panels:**

Invited lecture, conference session

Contemporary Ocular Motor and Vestibular Research: A Tribute to David A. Robinson

“The Analysis of Human OKN with New Methods from the Field of Nonlinear Dynamics”

October 1994

Invited lecture, conference session

Sixth Symposium on the Role of Vestibular Organs in Space Exploration

“Contextual Adaptation as a Spaceflight Neurovestibular Countermeasure”  
October 2002

Invited lecture  
Clinical And Basic Ocular Motor Research, meeting in honor of David S. Zee  
“Context-specific Adaptation of Saccade Gain is Enhanced with Rest Intervals Between Changes in Context State”  
July 2004

Invited lecture  
Workshop on the cerebellum and motor learning and conditioning  
“Error Signals for VOR Adaptation”  
October 2004

Invited lecture, conference session  
European Conference on Eye Movements  
“Statistics and Modeling of the Timing of Predictive Saccades”  
August 2005

Invited lecture  
University of Mississippi Medical Center  
“Adaptation to Parabolic Flight”  
May 2007

Invited lecture, conference session  
Gordon Research Conference on Oculomotor Control  
“Sequences of Predictive Saccades: Statistics, Self-organization, Neural Clocks”  
July 2007

Invited lecture  
City College of New York  
“Control of Predictive Saccades”  
January 2008

Invited lecture  
Girl Scouts ACE of Space Club, Baltimore  
“Physiological Aspects of Space Flight”  
April 2008

Keynote speaker  
Annual meeting of the Society for Chaos Theory in Psychology and Life Sciences  
“Timing is Everything – Statistics and Dynamics of Predictive and Reflexive Eye Movements”  
August 2008

Invited lecture  
Jenks Vestibular Physiology Laboratory 10<sup>th</sup> anniversary celebration  
Massachusetts Eye and Ear Infirmary  
Harvard Medical School  
“Can Modern Concepts in Motor Control Help in Recovery from Vestibular Deficits?”  
June 2009

Invited lecture  
Vestibular seminar  
Massachusetts Eye and Ear Infirmary  
Harvard Medical School  
“How to Do the Right Thing When the Right Thing is Different in Different Settings – Context-Specific Adaptation of Sensorimotor Behaviors”  
March 2010

Invited lecture, panel member  
Civil Air Patrol conference panel: Aerospace Education: New Directions in Human Spaceflight  
“Human Space Flight Space Life Sciences: What are the Issues?”  
February 2011

Invited lecture  
Department of Otolaryngology – Head & Neck Surgery commencement  
“The Vestibular System and Space Flight – The Ups and Downs of Balance Research”  
June 2011

Invited lecture  
American Institute of Aeronautics and Astronautics  
Johns Hopkins University Chapter  
“Human Adaptation to Space Flight”  
October 2011

Keynote speaker  
Mid-Atlantic Space Grant meeting  
Princeton University  
“What Happens to the Body in Space, and What to do About it – Human Sensorimotor Adaptation to Space Flights Long and Short”  
November 2011

Invited lecture  
Nebraska Biomechanics Core Facility  
University of Nebraska at Omaha  
“Is Fractal Scaling Relevant to Motor Control? – Evidence from Prediction and Adaptation in Eye Movements”  
January 2012

Invited lecture  
Neuroscience seminar  
McLean Hospital  
Harvard Medical School  
“Recent Findings on Predictive and Adaptive Motor Control – Lessons from Eye Movements, including the Role of the Cerebellum”  
March 2012

Invited lecture  
Boston Action Club  
Northeastern University  
“Prediction and Adaptation in Saccades, and the Role of Fractal Correlations”  
March 2012

Invited lecture  
Vestibular seminar  
Massachusetts Eye and Ear Infirmary  
Harvard Medical School  
“Prediction and Adaptation in Saccades, and the Role of Fractal Correlations”  
March 2012

Invited lecture  
Neuroscience seminar  
College of Medicine-Department of Physiology & Biophysics  
Howard University  
“Recent Findings on Predictive and Adaptive Motor Control – Lessons from Eye Movements and the Role of Fractal Scaling”  
September 2012

Invited lecture  
Computational neuroscience journal club  
Brandeis University  
“Fractal Structure in Vestibulo-ocular Adaptation”  
January 2013



Invited lecture, conference session  
The Vestibular System: A Clinical and Scientific Update in Siena  
Meeting in honor of Professor Daniele Nuti  
“Neurovestibular Considerations for a New Era in Human Spaceflight”  
April 2013

Invited lecture  
Brain Science Institute working group on computational neuroscience  
Johns Hopkins University School of Medicine  
“Fractal Correlations and Motor Control”  
April 2013

Invited lecture  
Astrobiology Lecture Series  
Space Telescope Science Institute  
“What Happens to the Human Body in Space – And What To Do About It”  
December 2013

Invited lecture  
Future In-Space Operations webinar series  
NASA Goddard Space Flight Center  
“NASA’s Approach to Critical Risks for Extended Human Space Flight”  
April 2014

Invited lecture  
Friday Science seminar series  
NASA Johnson Space Center  
“Predicting Sensorimotor Adaptation Ability through Fractal Time Series Analysis”  
April 2014

Invited lecture  
University of Houston  
“Predicting Sensorimotor Adaptation Ability through Fractal Time Series Analysis”  
April 2014

Invited lecture, session chair, discussion leader  
American Society for Gravitational and Space Research annual meeting  
“From the Bench to Exploration Medicine: NASA Translational Research Roadmap (TRR) Synergies  
Within Space and Synthetic Biology, Astrobiology, and the Human Research Program”  
October 2014

Invited lecture, panel member  
International Space Station Research and Development Conference  
“Can Humans Survive 1000 Days in Space?”  
July 2015

Invited lecture, panel member  
International Space Station Research and Development Conference  
“Good Health: The Impact of Space Science on Precision Medicine”  
July 2015

Invited lecture  
Santa Fe Institute  
“Complexity and Human Spaceflight: Ideas for Resilient Systems Development”  
September 2015

Invited lecture, panel member  
American Society for Gravitational and Space Research annual meeting  
“Microgravity Platforms other than ISS”  
November 2015

## OTHER PROFESSIONAL ACCOMPLISHMENTS

### Continuing education courses

IEEE Summer School in Biomedical Signal Processing, Siena, Italy, July 1995

Clinical Management of Common Auditory and Vestibular Disorders, and Vestibular Rehabilitation Practicum, Johns Hopkins, March 1997

Synaptic Function in Hearing and Balance, Johns Hopkins, June 2000

Vestibular Labyrinth in Health and Disease, Washington University School of Medicine, November 2000

NASA/NSBRI Russian Space Flight Countermeasures Course, Houston, TX, January 2000

Suborbital Scientist Training Course, NASTAR Center, Southampton, PA, August 2010

### Other activities

Project Leader and Principal investigator, NASA NSBRI Vestibular Experiment (1997-2004). Multi-investigator, multi-institutional research project addressed human vestibular adaptation to spaceflight. Project was invited to form a portion of the core research program when the NSBRI was formed in 1996, and subsequently passed peer review in 1997 and again in 2000.

Who's Who in Science and Engineering (2000-2001)

Interviewed for news item in *Johns Hopkins Medical News*, regarding parabolic flight experiments and the mission of the NSBRI.

Research on nonlinear analysis of eye movements featured in *The Scientist*: "Chaos Theory Finding New Applications in Life Sciences," August 22, 1994, p. 3.

First investigator from JHU SOM to perform life sciences experiments in parabolic flight (NASA aircraft which flies a parabolic arc to provide periods of free fall or "weightlessness").

Life sciences lead investigator for JHU proposal to the FAA for Center of Excellence in Commercial Space Transportation (unfunded, 2010).

Awarded no-cost parabolic flights for technology development (based on competitive proposals), NASA Flight Opportunities Program (2009- )

Director and organizer, JHMI CME course, August 2012 ("Emerging Opportunities in Space Life Sciences Research").

As Chief Scientist for Human Research for NASA: initiated cross-disciplinary approaches based on integrative physiology and complex systems, represented the Human Research Program to internal and external entities (including NIH, NSF, National Academy of Medicine), maintained scientific oversight of large and diverse research program, developed international coordination of research efforts.