

Curriculum Vitae

Tim Kiemel
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EDUCATION

Ph.D., Cornell University, Applied Mathematics, May 1990
Thesis title: *Three Problems from the Mathematics of Neural Oscillations*
Thesis adviser: Philip J. Holmes

M.S., Cornell University, Applied Mathematics, January 1988

B.Math., University of Minnesota, Mathematics, August 1984

PROFESSIONAL EXPERIENCE

2005–present, Research Assistant Professor, Department of Kinesiology, University of Maryland.

1992–2004, Research Associate, Department of Biology, University of Maryland.

1990–1992, NSF Mathematical Sciences Postdoctoral Research Fellow, Mathematical Research Branch, National Institutes of Health.

1990, Postdoctoral Fellow, Center for Complex Systems, Florida Atlantic University.

1989, Research Assistant, Center for Applied Mathematics, Cornell University.

1988–1989, Mathematical Science Institute Graduate Fellow, Center for Applied Mathematics, Cornell University.

1985–1988, NSF Graduate Fellow, Center for Applied Mathematics, Cornell University.

1984–1985, Teaching Assistant, Center for Applied Mathematics, Cornell University.

GRANTS AND HONORS

2012–2015, NSF Grant, *Collaborative Research: Understanding the Rules for Human Rhythmic Motor Coordination: From Walking to Juggling*. Project PI and PI of Univ. of Md. award BCS-1230311 (co-PIs: John J. Jeka, Norman M. Wereley). Collaboration with Johns Hopkins award BCS-1230493 (PI: Noah J. Cowan). \$620,714 (\$393,685 to Univ. of Md.).

2012–2013, Army Research Office, Short Term Innovative Research Grant, *Closing the Loop: Integrating Body, Muscle, and Environment with Locomotion Central Pattern Generators*. PI (Co-PI: Kathleen A. Hoffman). W911NF1210264, \$49,988.

2010–2015, NIH/NICHHD Grant, *Human Locomotor Plasticity in Health and Disease*. Co-Investigator (PI: Amy Bastian, Univ. of Md. subcontract PI: John J. Jeka). R01HD048741, \$102,595 to Univ. of Md.

2009–2012, NSF Grant, *The Interaction of Posture, Locomotion and Sensory Information*. Co-PI (PI: John J. Jeka). BCS-0924883, \$406,143.

2008–2012, NIH/NINDS Grant, *Multisensory Integration and Human Postural Control*. Co-Investigator (PI: John J. Jeka). R01NS035070-10A2, \$994,141.

2007–2008, NIH/NINDS Grant, *Multisensory Integration and Human Postural Control*. Co-Investigator (PI: John J. Jeka). R56NS035070-10, \$352,335

2005–2011, NIH/NINDS Grant, *An Integrated Locomotion Model for Lamprey Swimming*. Co-Investigator (PI: Avis H. Cohen). R01NS054271, \$1,510,601

2002–2008, NIH/NICHHD Grant, *Adaptive Sensorimotor Control in Children with DCD*. Co-Investigator (PI: Jane E. Clark). R01HD042527, \$1,526,299.

2002–2007, NIH/NINDS Grant, *Multisensory Integration and Human Postural Control*. Co-Investigator (PI: John J. Jeka). R01NS035070-06, \$1,036,000

2002–2006, NIH/NINDS Grant, *Mechanistic Model of Multisensory Postural Control*. Co-Investigator (PI: John J. Jeka). R01NS046065, \$391,767.

2000–2005, NIH/NINDS Grant, *Regulation of Functional Recovery after Spinal Injury*. Co-Investigator (PI: Avis H. Cohen). R01NS039909, \$891,702.

1997–2002, NIMH Grant, *Encoding Time: Dynamic Analysis of Behavior*. Co-Investigator (PI: Avis H. Cohen). R01MH44809, \$786,658.

1990–1992, NSF Mathematical Sciences Postdoctoral Research Fellowship.

1985–1988, NSF Graduate Fellowship.

Pending:

2013–2018, NIH Grant, *Investigation and Treatment of Sensory Fusion Deficits in Parkinson's Disease*. Multi-PI with John J. Jeka, \$2,112,897.

2013–2015, NIH Grant, *Multisensory Processing for the Control of Locomotion*. Multi-PI with John J. Jeka, \$398,249.

REFEREED PAPERS

1. Bair W-N, **Kiemel T**, Jeka JJ, Clark JE. Development of multisensory reweighting is impaired for quiet stance control in children with developmental coordination disorder (DCD). *PLoS ONE* 7(7): e40932, doi:10.1371/journal.pone.0040932, 2012.
2. Polastri PF, **Kiemel T**, Barela JA, Jeka JJ. Dynamics of inter-modality re-weighting during human postural control. *Exp Brain Res*, 223:99–108, 2012.
3. Scholz JP, Park E, Jeka JJ, Schöner G, **Kiemel T**. How visual information links to multijoint coordination during quiet standing. *Exp Brain Res* 222:229–239, 2012.
4. **Kiemel T**, Zhang Y, Jeka JJ. Identification of neural feedback for upright stance in humans: stabilization rather than sway minimization. *J Neurosci* 31:15144–15153, 2011.
5. Fuchs E, Holmes P, **Kiemel T**, Ayali A. Intersegmental coordination of cockroach locomotion: adaptive control of centrally coupled pattern generator circuits. *Frontiers Neural Circuit* 4:125, 2011.
6. **Kiemel T**, Zhang Y, Jeka JJ. Visual flow is interpreted relative to multisegment postural control. *J Motor Behav* 43:237–246, 2011.

7. Previte JP, Sheils N, Hoffman KA, **Kiemel T**, Tytell ED. Entrainment ranges of forced phase oscillators. *J Math Biol* 62:589–603, 2011.
8. Klein TJ, Jeka J, **Kiemel T**, Lewis, MA. Navigating sensory conflict in dynamic environments using adaptive state estimation. *Biol Cybern* 105:291–304, 2011.
9. Jeka JJ, Allison LK, **Kiemel T**. The dynamics of multi-sensory reweighting in healthy and fall-prone older adults. *J Motor Behav* 42:197–208, 2010.
10. Logan D, **Kiemel T**, Dominici N, Cappellini G, Ivanenko Y, Lacquaniti F, Jeka JJ. The many roles of vision during walking. *Exp Brain Res* 206:337–350, 2010.
11. Carver SG, **Kiemel T**, Cowan NJ, Jeka JJ. Optimal motor control may mask sensory dynamics. *Biol Cybern* 101:35–42, 2009.
12. Saffer M, **Kiemel T**, Jeka J. Coherence analysis of muscle activity during quiet stance. *Exp Brain Res* 185:215–226, 2008.
13. Várkonyi PL, **Kiemel T**, Hoffman K, Cohen AH, Holmes P. On the derivation and tuning of phase oscillator models for lamprey central pattern generators. *J Comput Neurosci* 25:245–61, 2008.
14. Creath R, **Kiemel T**, Horak F, Jeka JJ. The role of vestibular and somatosensory systems in intersegmental control of upright stance. *J Vestib Res* 18:39–49, 2008.
15. Gelman S, Ayali A, **Kiemel T**, Sanovich E, Cohen AH. Metamorphosis-related changes in the lateral line system of lampreys, *Petromyzon marinus*. *J Comp Physiol A* 194:945–956, 2008.
16. Jeka JJ, Oie KS, **Kiemel T**. Asymmetric adaptation with functional advantage in human sensorimotor control. *Exp Brain Res* 191:453–463, 2008.
17. **Kiemel T**, Elahi AJ, Jeka JJ. Identification of the plant for upright stance in humans: multiple movement patterns from a single neural strategy. *J Neurophysiol* 100:3394–3406, 2008.
18. Zhang YF, **Kiemel T**, Jeka J. The influence of sensory information on two-component coordination during quiet stance. *Gait & Posture* 26:263–271, 2007.
19. Hsu WL, Scholz JP, Schöner G, Jeka JJ, **Kiemel T**. Control and estimation of posture during quiet stance depends on multijoint coordination. *J Neurophysiol* 97:3024–3035, 2007.
20. Bair W, **Kiemel T**, Jeka JJ, Clark JE. Development of multisensory reweighting for posture control in children. *Exp Brain Res* 183:435–446, 2007.
21. **Kiemel T**, Oie KS, Jeka JJ. Slow dynamics of postural sway are in the feedback loop. *J Neurophysiol* 95:1410–1418, 2006.
22. Carver S, **Kiemel T**, Jeka JJ. Modeling the dynamics of sensory reweighting. *Biol Cybern* 95:123–134, 2006.

23. Jeka J, Allison L, Saffer M, Zhang YF, Carver S, **Kiemel T**. Sensory reweighting with translational visual stimuli in young and elderly adults: the role of state-dependent noise. *Exp Brain Res* 174:517–527, 2006.
24. Allison LK, **Kiemel T**, Jeka JJ. Multisensory reweighting of vision and touch is intact in healthy and fall-prone older adults. *Exp Brain Res* 175:342–352, 2006.
25. Ravaioli E, Oie KS, **Kiemel T**, Chiari L, Jeka JJ. Nonlinear postural control in response to visual translation. *Exp Brain Res* 160:450–459, 2005.
26. Creath R, **Kiemel T**, Horak F, Peterka R, Jeka J. A unified view of quiet and perturbed stance: simultaneous co-existing excitable modes. *Neurosci Lett* 377:75–80, 2005.
27. Carver S, **Kiemel T**, van der Kooij H, Jeka JJ. Comparing internal models of the dynamics of the visual environment. *Biol Cybern* 92:147–163, 2005.
28. Jeka J, **Kiemel T**, Creath R, Horak F, Peterka R. Controlling human upright posture: velocity information is more accurate than position or acceleration. *J Neurophysiol* 92:2368–2379, 2004.
29. **Kiemel T**, Gormley KM, Guan L, Williams TL, Cohen AH. Estimating the strength and direction of functional coupling in the lamprey spinal cord. *J Comput Neurosci* 15:233–245, 2003.
30. Creath R, **Kiemel T**, Horak F, Jeka JJ. Limited control strategies with the loss of vestibular function. *Exp Brain Res* 145:323–333, 2002.
31. Oie KS, **Kiemel T**, Jeka JJ. Multisensory fusion: simultaneous re-weighting of vision and touch for the control of human posture. *Cognitive Brain Res* 14:164–176, 2002.
32. **Kiemel T**, Oie KS, Jeka JJ. Multisensory fusion and the stochastic structure of postural sway. *Biol Cybern* 87:262–277, 2002.
33. **Kiemel T**, Cohen AH. Bending the lamprey spinal cord causes a slowly-decaying increase in the frequency of fictive swimming. *Brain Res* 900:57–64, 2001.
34. Guan L, **Kiemel T**, Cohen AH. Impact of movement-related feedback on the lamprey central pattern for locomotion. *J Exp Biol* 204:2361–2370, 2001.
35. Oie KS, **Kiemel T**, Jeka JJ. Human multisensory fusion of vision and touch: detecting non-linearity with small changes in the sensory environment. *Neurosci Lett* 315:113–116, 2001.
36. Jeka J, Oie KS, **Kiemel T**. Multisensory information for human postural control: integrating touch and vision. *Exp Brain Res* 134:107–125, 2000.
37. Cohen AH, **Kiemel T**, Pate V, Blinder J, Guan L. Temperature can alter the functional outcome of spinal cord regeneration in larval lampreys. *Neuroscience* 90:957–965, 1999.
38. **Kiemel T**, Cohen AH. Estimation of coupling strength in regenerated lamprey spinal cords based on a stochastic phase model. *J Comput Neurosci* 5:267–284, 1998.

39. Cohen AH, Guan L, Harris J, Ranu Jung R, **Kiemel T**. Interaction between the caudal brainstem and the lamprey central pattern generator for locomotion. *Neuroscience* 74:1161–1173, 1996.
40. Jung R, **Kiemel T**, Cohen AH. Dynamical behavior of a neural network model of locomotor control in the lamprey. *J Neurophysiol* 75:1074–1086, 1996.
41. Bertram R, Manish J, Butte MJ, **Kiemel T**, Sherman A. Topological and phenomenological classification of bursting oscillations. *Bull Math Biol* 57:413–439, 1995.
42. Mellen N, **Kiemel T**, Cohen AH. Correlational analysis of fictive swimming in the lamprey reveals strong intersegmental connectivity. *J Neurophysiol* 73:1020–1030, 1995.
43. Jeka JJ, J.A.S. Kelso JAS, **Kiemel T**. Pattern switching in human multilimb coordination dynamics. *Bull Math Biol* 55:829–845, 1993.
44. Cohen AH, **Kiemel T**. Intersegmental coordination: lessons from modeling systems of coupled non-linear oscillators. *Am Zool* 33:54–65, 1993.
45. Frankel P, **Kiemel T**. Relative phase behavior of two slowly coupled oscillators. *SIAM J Appl Math* 53:1436–1446, 1993.
46. Jeka JJ, J.A.S. Kelso JAS, **Kiemel T**. Spontaneous transitions and symmetry: pattern dynamics in human four-limb coordination. *Hum Movement Sci* 12:627–651, 1993.
47. Cohen AH, Ermentrout GB, **Kiemel T**, Kopell N, Sigvardt KA, Williams TL. Modelling of intersegmental coordination in the lamprey central pattern generator for locomotion. *Trends Neurosci* 15:434–438, 1992.
48. Cohen AH, Dobrov TA, Guan L, **Kiemel T**, Baker MT. The development of the lamprey pattern generator for locomotion. *J Neurobiol* 21:958–969, 1990.
49. **Kiemel T**, Holmes P. A model for the periodic synaptic inhibition of a neuronal oscillator. *IMA J Math Appl Med Biol* 4:145–169, 1987.

Submitted:

Clapp G, Hoffman K, **Kiemel T**. Entrainment ranges for chains of forced neural oscillators. Under revision.

Allison LK, **Kiemel T**, Jeka JJ. The effect of sensory-challenge balance exercises on multi-sensory re-weighting and balance in fall-prone older adults.

Anson E, Agada P, **Kiemel T**, Jeka J. Visual feedback improves control of locomotion in healthy adults.

Logan D, Ivanenko YP, **Kiemel T**, Cappellini G, Sylos Labini F, Lacquaniti F, Jeka JJ. Function dictates the phase dependence of vision during human locomotion.

BOOK CHAPTERS

Jeka JJ, **Kiemel T**. Modeling of human postural control. In: Binder MD, Hirokawa N, Windhorst U (Eds.) *Encyclopedia of Neuroscience*, Springer, 2009.

Cohen AH, **Kiemel T**. Swim oscillator networks. In: Squire LR (Ed.) *Encyclopedia of Neuroscience*, Academic Press, Oxford, 2009.

PRESENTATIONS (since 2006)

Kiemel T, Bair W, Hwang S, Clark JE, Jeka JJ. Closed-loop system identification as a tool to understand re-weighting of sensory information during standing. Oral presentation at Dynamic Walking 2012, Pensacola Beach, FL, 2012.

Kiemel T, Hoffman KA. Non-uniform coupling asymmetry conjecture: experiment, theory, and future work. Oral presentation at the Winter Workshop on Locomotion, Princeton, NJ, 2012.

Kiemel T, Jeka JJ. A model of the postural control system for standing based on closed-loop system identification and the stochastic structure of kinematic and EMG signals. Poster presentation at the 41th annual meeting of the Society for Neuroscience, Washington, DC, 2011.

Kiemel T, Jeka JJ. Identifying the plant and feedback in human postural control. Oral presentation at the SIAM Conference on Control and Its Applications, Baltimore, MD, 2011.

Kiemel T, Logan D, Ivanenko Y, Lacquaniti, F, Jeka JJ. A comparison of the effects of visual-scene motion on walking and standing and the role of stability. Oral presentation at the 16th US National Congress of Theoretical and Applied Mechanics, State College, PA, 2010.

Kiemel T, Zhang Y, Jeka JJ. Understanding human postural control using closed-loop system identification. Oral presentation at the Workshop on Noise, Time Delay and Balance Control, Banff International Research Station for Mathematical Innovation and Discovery, Banff, Canada, 2009.

Kiemel T, Zhang YF, Jeka JJ. Closed-loop system identification of the plant and feedback for postural control of upright stance in humans: the implications of multiple degrees of freedom. Poster presentation at the 39th annual meeting of the Society for Neuroscience, Chicago, IL, 2009.

Kiemel T, Jeka JJ. Modeling of multi-joint postural control of upright stance based on closed-loop system identification of plant and feedback processes. Poster presentation at the 38th annual meeting of the Society for Neuroscience, Washington, DC, 2008.

Kiemel T. Phase approximations of coupled neural oscillators. Oral presentation at the Department of Mathematics, University of Maryland, Baltimore County, 2007.

Kiemel T, Elahi AJ, Jeka JJ. Modeling of multi-joint postural control based on kinematic and EMG data. Poster presentation at the 18th meeting of the International Society for Posture and Gait Research, Burlington, VT, 2007.

Kiemel T, Jeka JJ. Does the slow component of postural sway reflect errors in state estimation? Oral presentation at the 4th Human Posture Symposium, Smolenice, Slovakia, 2006.

TEACHING AND MENTORING

Spring 2013, will teach Kinesiology 689D, *Physiological Signal Processing*.

Spring 2012, co-taught Kinesiology 689W/Aerospace Engineering 788W, *Anthropomorphic Robotics*. Instructor evaluation: 3.28 out of 4.00 (college comparison: 3.38).

Spring 2009, co-taught Kinesiology 689F, *Neuromechanics of Muscle*. Instructor evaluation: 3.72 out of 4.00 (college comparison: 3.21).

Fall 2005 and Spring 2008, co-taught Kinesiology 689M, *Motor Control Theory* (instructor evaluation not available).

Service on Ph.D. examining committees: Leslie Allison (2006), Robert Creath (2008), Jason Metcalf (2007), Kelvin Oie (2006), Yuanfen Zhang (2009).

Service on Master's examining committees: Katherine Amenabar (2009), David Logan (2009), Yuanfen Zhang (2006).

Undergraduate student mentoring:

Rohan Bhale (Mathematics, Bioengineering). Mr. Bhale is a junior University Honors student who I am working with on frequency-domain analysis and modeling of walking. He presented this work at the Winter Workshop on Locomotion at Princeton University in January, 2012.

Geoffrey Clapp (Mathematics, Computer Science). I worked with Mr. Clapp as part of a collaboration with his advisor, Dr. Kathleen Hoffman, that resulted in a submitted paper with Mr. Clapp as first author.

Graduate student mentoring: Peter Agada (Kinesiology), Leslie Allison (Kinesiology), Katherine Amenabar (Kinesiology), Woei-Nan Bair (Kinesiology), David Boothe (Neural and Cognitive Sciences), Robert Creath (Kinesiology), Alexander Elahi (Kinesiology), David Logan (Neural and Cognitive Sciences), Nick Mellen (Psychology), Kelvin Oie (Neural and Cognitive Sciences), Yuanfen Zhang (Neural and Cognitive Sciences)

Postdoctoral mentoring: Sean Carver, Sung-Jae Hwang

SERVICE

Member of the steering committee of the NSF Research Coordination Network *Neuromechanics and Dynamics of Locomotion* (PI: Lisa J. Fauci, Co-PI: Avis H. Cohen), 2011–present.

Ad hoc grant reviewer: National Institutes of Health, National Science Foundation.

Ad hoc journal reviewer: *Biological Cybernetics*, *Bulletin of Mathematical Biology*, *Computers in Biology and Medicine*, *European Journal of Neuroscience*, *Experimental Brain Research*, *Gait and Posture*, *IEEE Transactions on Biomedical Engineering*, *IEEE Transactions on Neural Networks*, *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, *Journal of Biomechanics*, *Journal of Computational Neuroscience*, *Journal of Neurophysiology*, *Journal of Neuroscience Methods*, *Journal of Neuroengineering and Rehabilitation*, *Journal of Theoretical Biology*, *Mathematical Biosciences*, *Mathematical and Computer Modelling*, *Medical & Biological Engineering & Computing*, *Neural Computation*, *Neural Networks*, *Neuroreport*, *Neuroscience*, *Physics Letters A*, *PLoS ONE*, *SIAM Journal on Applied Mathematics*, *System & Control Letters*