Daniel P. Ferris Curriculum Vitae (revised 06/09)

School of Kinesiology
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Current Positions

Associate Professor, Dept. of Movement Science, U. of Michigan. 9/06-pres.
Graduate Chair, School of Kinesiology, U. of Michigan. 9/06-6/09
Associate Professor, Dept. of Biomedical Engineering, U. of Michigan. 9/06-pres.
Faculty Member, Neuroscience Graduate Program, U. of Michigan. 3/06-pres.
Adjunct Associate Professor, Dept. of Physical Medicine & Rehabilitation, U. of Michigan. 9/07-pres.

Past Positions

Visiting Scholar, Div. of Neurophysiology, Panum Institute, U. of Copenhagen. 4/97-5/97
Post-Doctoral Fellow, Dept. of Neurology, UCLA. 10/98-4/00
Post-Doctoral Fellow, Dept. of Electrical Engineering, U. of Washington. 5/00-8/01
Assistant Professor, Dept. of Movement Science, U. of Michigan. 9/01-8/06
Assistant Professor, Dept. of Biomedical Engineering, U. of Michigan. 9/01-8/06
Adjunct Assistant Professor, Dept. of Physical Medicine & Rehabilitation, U. of Michigan. 5/05-8/07
Visiting Scholar, Institute for Neural Computation, UC San Diego, 1/08-6/08

Education

Ph.D., *Human Biodynamics*, University of California, Berkeley, 1998
M.S., *Exercise Physiology*, University of Miami, 1994
B.S., *Mathematics Education*, University of Central Florida, 1992

Journal Papers (Peer Reviewed)

41. Domingo A and **Ferris DP** (2009) Effects of physical assistance on learning balance during narrow beam walking. *Gait and Posture*, in press.
40. Klimstra MD, Thomas E, Stoloff RH, **Ferris DP** and Zehr EP (2009) Neuromechanical considerations for incorporating rhythmic arm movement in the rehabilitation of walking. *Chaos*, in press.
39. Sawicki GS and **Ferris DP** (2009) A pneumatically powered knee-ankle-foot orthosis (KAFO) with myoelectric activation and inhibition. *Journal of Neuroengineering and Rehabilitation*, in press.
38. Huang HJ and **Ferris DP** (2009) Excitatory neural coupling between upper and lower limbs is bidirectional and ipsilateral. *Medicine and Science in Sports and Exercise*, in press.
37. Sawicki GS, Lewis CL and **Ferris DP** (2009) It pays to have a spring in your step. *Exercise and Sport Sciences Reviews*, in press.
36. Simon AM, Kelly BM and **Ferris DP** (2009) Sense of effort determines lower limb force production during dynamic movement in individuals with post-stroke hemiparesis. *Neurorehabilitation and Neural Repair*, in press.
35. Kinnaird CR and **Ferris DP** (2009) Medial gastrocnemius myoelectric control of a robotic ankle exoskeleton for human walking. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 17:31-37.
34. Kao P-C and **Ferris DP** (2009) Motor adaptation during dorsiflexion-assisted walking with a powered orthosis. *Gait and Posture*, 29:230-236.

33. Gordon KE, **Ferris DP** and Kuo AD (2009) Metabolic and mechanical energy costs of reducing vertical center of mass movement during gait. *Archives of Physical Medicine and Rehabilitation*, 90:136-144.
32. Collins SH, Adamczyk PG, **Ferris DP** and Kuo AD (2009) A simple method for calibrating force plates and treadmills using an instrumented pole. *Gait and Posture*, 29:59-64.
31. Sawicki GS and **Ferris DP** (2009) Mechanics and energetics of incline walking with robotic ankle exoskeletons. *Journal of Experimental Biology*, 212:32-41.
30. Sawicki GS and **Ferris DP** (2009) Powered ankle exoskeletons reveal the metabolic cost of plantar flexor mechanical work during walking with longer steps at constant step frequency. *Journal of Experimental Biology*, 212:21-31.
29. Lewis CL and **Ferris DP** (2008) Walking with increased ankle pushoff decreases hip moments. *Journal of Biomechanics*, 41:2082-2089.
28. Sawicki GS and **Ferris DP** (2008) Mechanics and energetics of level walking with powered ankle exoskeletons. *Journal of Experimental Biology*, 211:1402-1413.
27. Simon AM and **Ferris DP** (2008) Lower limb force production and bilateral force asymmetries are based on sense of effort. *Experimental Brain Research*, 187:129-138.
26. Pelc E, Daley MA, and **Ferris DP** (2008) Resonant hopping of a robot controlled by an artificial neural oscillator. *Bioinspiration and Biomimetics*, 3(2):26001.
25. Cain S, Gordon KE and **Ferris DP** (2007) Human motor adaptation during walking with a powered ankle-foot orthosis depends on control method. *Journal of Neuroengineering and Rehabilitation*, 4:48.
24. **Ferris DP**, Sawicki GS and Daley MA (2007) A physiologist's perspective on robotic exoskeletons for human locomotion. *International Journal of Humanoid Robotics*, 4:507–528.
23. Domingo A, Sawicki GS and **Ferris DP** (2007) Kinematics and muscle activity of individuals with incomplete spinal cord injury during treadmill stepping with and without manual assistance. *Journal of Neuroengineering and Rehabilitation*, 4:32.
22. Zehr EP, Balter JE, **Ferris DP**, Hundza SR, Loadman P and Stoloff RH (2007) Neural control of rhythmic arm and leg movement is conserved across human locomotor tasks. *Journal of Physiology*, 582: 209-227.
21. Gordon KE and **Ferris DP** (2007) Learning to walk with a robotic ankle exoskeleton. *Journal of Biomechanics*, 40:2636-2644.
20. Stoloff RH, Zehr EP and **Ferris DP** (2007) Recumbent stepping has similar but simpler neural control compared to walking. *Experimental Brain Research*, 178:427-438.
19. Simon AM, Gillespie RB and **Ferris DP** (2007) Symmetry-based resistance as a novel means of lower limb rehabilitation. *Journal of Biomechanics*, 40:1286-1292.
18. **Ferris DP**, Huang HJ and Kao P-C (2006) Moving the arms to activate the legs. *Exercise and Sport Sciences Reviews*, 34:113-120.
17. Gordon KE, Sawicki GS and **Ferris DP** (2006) Mechanical performance of artificial pneumatic muscles to power an ankle-foot orthosis. *Journal of Biomechanics*, 39:1832-1841.
16. **Ferris DP**, Gordon KE, Sawicki GS and Peethambaran A (2006) An improved powered ankle-foot orthosis using proportional myoelectric control. *Gait and Posture*, 23:425-428.
15. Sawicki GS, Domingo A and **Ferris DP** (2006) The effects of powered ankle foot orthoses on muscle activation and joint kinematics during walking by individuals with incomplete spinal cord injury. *Journal of Neuroengineering and Rehabilitation*, 3(1):3.
14. **Ferris DP**, Bohra ZA, Lukos JR and Kinnaird CR (2006) Neuromechanical adaptation to hopping with an elastic ankle-foot orthosis. *Journal of Applied Physiology*, 100:163-170.
13. **Ferris DP**, Sawicki GS and Domingo AR (2005) Powered lower limb orthoses for gait rehabilitation. *Topics in Spinal Cord Injury Rehabilitation*, 11:34-49.
12. **Ferris DP**, Czerniecki JM and Hannaford B (2005) An ankle-foot orthosis powered by artificial pneumatic muscles. *Journal of Applied Biomechanics*, 21:189-197.
11. Kao P-C and **Ferris DP** (2005) The effect of movement frequency on interlimb coupling during recumbent stepping. *Motor Control*, 9:144-163.
10. Gordon KE and **Ferris DP** (2004) Proportional myoelectric control of a virtual object to investigate human efferent control. *Experimental Brain Research*, 159:478-486.

9. Huang HJ and **Ferris DP** (2004) Neural coupling between upper and lower limbs during recumbent stepping. *Journal of Applied Physiology*, 97:1299-1308.
8. **Ferris DP**, Gordon KE, Beres JA and Harkema SH (2004) Muscle activation during unilateral stepping occurs in the nonstepping limb of humans with clinically complete spinal cord injury. *Spinal Cord*, 42:14-23.
7. **Ferris DP**, Aagaard P, Simonsen EB, Farley CT, and Dyhre-Poulsen P (2001) Soleus H-reflex gain in humans walking and running under simulated reduced gravity. *Journal of Physiology*, 530:167 180.
6. **Ferris DP**, Liang K and Farley CT (1999) Runners adjust leg stiffness for their first step on a new running surface. *Journal of Biomechanics*, 32:787-794.
5. **Ferris DP**, Louie M and Farley CT (1998) Running in the real world: adjusting leg stiffness for different surfaces. *Proceedings of the Royal Society of London: Biological Sciences*, 265:989-994 (cover).
4. Farley CT and **Ferris DP** (1998) Biomechanics of walking and running: from center of mass movement to muscle action. *Exercise and Sport Sciences Reviews*, 26:253-285.
3. **Ferris DP** and Farley CT (1997) Interaction of leg stiffness and surface stiffness during human hopping. *Journal of Applied Physiology*, 82:15-22 (cover).
2. Kram R, Domingo A and **Ferris DP** (1997) Effect of reduced gravity on the preferred walk-run transition speed. *Journal of Experimental Biology*, 200:821-826.
1. **Ferris DP**, Signorile JF and Caruso JF (1995) The relationship between physical and physiological variables and volleyball spiking velocity. *Journal of Strength and Conditioning Research*, 9:32-36.

Journal Manuscripts in Review

5. Huang HJ and **Ferris DP** (in review) Neural mechanisms for upper and lower limb neural coupling. *Biological Cybernetics*.
4. Kao PC, Lewis CL and **Ferris DP** (in review) Short-term locomotor adaptation to a robotic ankle exoskeleton does not alter soleus Hoffmann reflex amplitude. *Neuroscience Letters*.
3. Kao PC, Lewis CL and **Ferris DP** (in review) Joint kinetic response during unexpectedly reduced plantar flexor torque provided by a robotic ankle exoskeleton during walking. *Journal of Applied Physiology*.
2. Kao PC, Lewis CL and **Ferris DP** (in review) Invariant ankle moment patterns when walking with and without a robotic ankle exoskeleton. *Journal of Biomechanics*.
1. Huang HJ and **Ferris DP** (in review) Upper limb effort does not increase maximal voluntary muscle activation in individuals with incomplete spinal cord injury. *Clinical Neurophysiology*.

Journal Manuscripts in Preparation (data collection is completed)

3. Lewis CL and **Ferris DP** (in preparation) A robotic hip exoskeleton for assisting human walking. *Journal of Biomechanics*.
2. Domingo A and **Ferris DP** (in preparation) Effects of error augmentation on learning balance during narrow beam walking. *Journal of Motor Behavior*.
1. Gordon KE and **Ferris DP** (in preparation) A neurobotic simulation of antagonistic coactivation during human walking. *Journal of Neurophysiology*.

Engineering Conference Papers (Peer Reviewed)

7. Cherry MS, Kota S and **Ferris DP** (2009) An elastic exoskeleton for assisting human running. *Proceedings of the International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE),* August 30-September 2, San Diego, CA, USA, in press.
6. Simon AM, Kelly BM and **Ferris DP** (2009) Preliminary trial of symmetry-based resistance in individuals with post-stroke hemiparesis. *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Minneapolis, MN, in press.

5. Reinkensmeyer DJ, Akoner OM, **Ferris DP** and Gordon KE (2009) Slacking by the human motor system: computational models and implications for robotic orthoses. *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Minneapolis, MN, in press.
4. **Ferris DP** and Lewis CL (2009) Robotic lower limb exoskeletons using proportional myoelectric control. *Proceedings of the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Minneapolis, MN, in press.
3. Cherry MS, Choi DJ, Deng KJ, Kota S and **Ferris DP** (2006) Design and fabrication of an elastic knee orthosis - preliminary results. *Proceedings of the International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE)*, September 10-13, Philadelphia, PA, USA, DETC2006-99622.
2. Sawicki GS, Gordon KE and **Ferris DP** (2005) Powered lower limb orthoses: applications in motor adaptation and rehabilitation. *IEEE Proceedings of the International Conference on Rehabilitation Robotics*, 206-211.
1. Danek KA, Gillespie RB, Aldridge JW, **Ferris DP** and Grizzle JW (2005) A dual input device for self-assisted control of a virtual pendulum. *IEEE Proceedings of the International Conference on Rehabilitation Robotics*, 313-318.

Publications (Non-Peer Reviewed)

2 **Ferris DP** (2009) The exoskeletons are here. *Journal of Neuroengineering and Rehabilitation*, in press.
1. **Ferris DP** (2008) Case Study: an ankle–foot orthosis powered by artificial pneumatic muscles. In *Wearable Robots: Biomechatronic Exoskeletons*, ed. Pons JL. (Wiley, John & Sons) pp. 349-355.

Recent Abstracts (projects not yet published as full papers)

7. Huang HJ and **Ferris DP** (2008) Neural coupling between the upper and lower limbs in individuals with incomplete spinal cord injury. *Proceedings of the North American Congress on Biomechanics*, August 5-9, 2008, Ann Arbor, MI.
6. Kao PC, Lewis CL and **Ferris DP** (2008) Motor response during unexpectedly reduced plantar flexor torque provided by a powered orthosis during walking. *Proceedings of the North American Congress on Biomechanics*, August 5-9, 2008, Ann Arbor, MI.
5. Lewis CL, Kao PC and **Ferris DP** (2008) Invariant ankle moment patterns with plantar flexor assistance from a powered ankle orthosis. *Proceedings of the North American Congress on Biomechanics*, August 5-9, 2008, Ann Arbor, MI.
4. Domingo A and **Ferris DP** (2008) Physical assistance can be detrimental to learning walking balance. *Proceedings of the North American Congress on Biomechanics*, August 5-9, 2008, Ann Arbor, MI.
3. Danek KA, **Ferris DP**, Grizzle JW and Gillespie RB (2007) Anticipatory actions in the lower limbs in response to self-triggered and computer-cued load perturbations. *Proceedings of the 31st Annual Meeting of the American Society of Biomechanics*, August 22-25, 2007, Palo Alto, CA.
2. Cain SM and **Ferris DP** (2007) Walking in simulated hyper-gravity. *Proceedings of the 31st Annual Meeting of the American Society of Biomechanics*, August 22-25, 2007, Palo Alto, CA.
1. Chang CL and **Ferris DP** (2005) A neuromuscular model to understand muscle co-activation during walking. *Second Asian Pacific Conference on Biomechanics*, November 23-25, Taipei, Taiwan.

Book Review

1. **Ferris, DP** (2003) Neurotechnology for Biomimetic Robots, ed. J. Ayers, J.L. Davis, and A. Rudolph. *The Quarterly Review of Biology*, 78(3):380.

Extramural Grants Funded (Completed)

10. *CAREER: Biomechanics and Energetics of Human Locomotion with Powered Exoskeletons*
Principal Investigator: Daniel Ferris (15% effort)
Agency: National Science Foundation (BES-0347479)
Period: 04/01/04 – 03/30/09
Amount: $426,218 Total Costs
Aim: To determine if powered lower limb exoskeletons can reduce the metabolic cost of walking.

9. *Motor Adaptation during Human Locomotion*
Principal Investigator: Daniel Ferris (40% effort)
Agency: NIH (R01 NS45486)
Period: 09/01/02 – 07/31/07
Amount: $1,233,622 Total Costs
Aim: To determine how healthy subjects adapt to walking with powered ankle-foot orthoses.

8. *Control of Balance during Human Walking*
Principal Investigator: Arthur D. Kuo, UM (Daniel Ferris, Co-Investigator, 10% effort)
Agency: NIH (R21 DC006466)
Period: 1/15/04 – 12/31/06
Amount: $392,141 Total Costs
Aim: To determine how humans balance their bodies during walking.

7. *Efficacy of Coupled Rhythmic Arm and Leg Movement as an Alternative to Body Weight Supported Walking Training for Recovery of Walking after Incomplete Spinal Cord Injury*
Principal Investigator: E. Paul Zehr (Daniel Ferris, Co-Investigator, 5% effort)
Agency: Rick Hansen Man In Motion Foundation
Period: 07/01/05 – 6/30/06
Amount: $27,813 Total Costs
Aim: To compare reflex modulation in spinal cord injury subjects during rhythmic movements.

6. *Network Collaboration for CRPF Grantees*
Principal Investigator: Daniel Ferris (5% effort)
Agency: Christopher Reeve Paralysis Foundation
Period: 07/15/04 – 12/15/04
Amount: $5,000 Total Costs
Aim: To compare reflex modulation patterns for walking and recumbent stepping.

5. *Recumbent Stepping for Gait Rehabilitation after Spinal Cord Injury*
Principal Investigator: Daniel Ferris (20% effort)
Agency: Paralyzed Veterans of America Spinal Cord Research Foundation (2293-01)
Period: 10/01/03 – 03/31/06
Amount: $150,000 Total Costs
Aim: To assess the feasibility of using self-assisted recumbent stepping as gait rehabilitation therapy after spinal cord injury.

4. *A Powered Lower Limb Exoskeleton to Assist Locomotor Training*
Principal Investigator: Daniel Ferris (20% effort)
Agency: Christopher Reeve Paralysis Foundation
Period: 12/15/01 – 12/15/04
Amount: $150,000 Total Costs
Aim: To build a pneumatically-powered orthosis for locomotor training after spinal cord injury.

3. *Motor Adaptation during Human Locomotion*
Principal Investigator: Daniel Ferris (100% effort)
Agency: NIH (F32 AR08602)
Period: 05/01/00 – 06/30/01
Amount: $65,212 Total Costs
Aim: To assess the feasibility of using myoelectrically controlled orthoses to study gait adaptation.

2. *H-Reflex Modulation During Human Locomotion*
Principal Investigator: Poul Dyhre-Poulsen (Daniel Ferris, Co-Investigator)
Agency: Danish Sports Research Council
Period: 1997
Amount: $5,667 Total Costs
Aim: To examine H-reflex gain during simulated reduced gravity locomotion.

1. *The Biomechanics of Reduced Gravity Locomotion*
Principal Investigator: Daniel Ferris (50% effort)
Agency: NASA (NGT-51416)
Period: 09/01/95 – 08/30/98
Amount: $66,000 Total Costs
Aim: To examine the effects of reduced gravity on muscle activation and walk-run transition speed.

Extramural Grants Funded (Active)

5. *Intelligent Prosthetic Knee-Ankle-Foot System with Coordinated Joint Action*
Principal Investigator: Art Kuo (D. Ferris, Co-I, 17% effort)
Agency: U.S. Army Medical Research and Materiel Command (W81XW-08-DRMRP-ATTDA)
Period: 07/01/09 – 06/30/14
Amount: $8,712,373 Total Costs (UM portion $3,463,351 Total Costs; Ferris subcontract $799,383 Total Costs)
Aim: To develop a bionic lower limb prosthesis.

4. *High-Density Electroencephalography System*
Principal Investigator: Daniel Ferris (0% effort)
Agency: Army Research Laboratory (W911NF-09-1-0139)
Period: 04/15/09 – 04/14/10
Amount: $179,000 Total Costs
Aim: Equipment grant to purchase a high-density electroencephalography system.

3. *Mobile Brain Imaging: Monitoring the Brain Dynamics of Motivated Action*
Principal Investigator: Scott Makeig (D. Ferris, Co-I, 10% effort)
Agency: Office of Naval Research (N000140811215)
Period: 11/1/08 – 10/31/12
Amount: $3,402,119 Total Costs (Ferris subcontract $261,169 Total Costs)
Aim: To develop EEG based functional brain imaging for use during human movement.

2. *Robotic Orthoses for Gait Rehabilitation*
Principal Investigator: Daniel Ferris (21% effort)
Agency: NIH (R21 NS062119)
Period: 02/01/08 – 01/31/10
Amount: $351,688 Total Costs
Aim: To determine if individuals with incomplete spinal cord injury improve their energetics, biomechanics, and neural control from practice walking with powered ankle-foot orthoses.

1. *The University of Michigan Medical Rehabilitation Research Training Program*
Principal Investigator: Denise Tate (Daniel Ferris, Mentor, 0% effort)
Agency: National Institutes of Health (T32 HD007422)
Period: 05/01/06 – 04/30/11
Amount: $1,535,015 Total Costs (Ferris subcontract is support of one postdoctoral fellow)
Aim: To support post-doctoral training in rehabilitation research.

Extramural Grants (Pending)

4. *Mobile functional brain imaging during human walking*
Principal Investigator: D. Ferris (30% effort)
Agency: National Institutes of Health
Period: 10/01/09 – 09/30/11
Amount: $730,989 Total Costs
Aim: To develop better methods for quantifying brain activity during human walking.

3. *Cognition and Neuroergonomics Collaborative Technology Alliance (CTA)*
Principal Investigator: Tim Lee (D. Ferris, Co-I, 20% effort)
Agency: Army Research Laboratory
Period: 12/01/09 – 11/30/14
Amount: $25,000,000 Total Costs (Ferris subcontract $2,200,000 Total Costs)
Aim: To develop new experimental and computational techniques and theories for understanding human motor performance with simultaneous cognitive load.

2. *High density EEG-based functional brain imaging during human walking*
Principal Investigator: D. Ferris (8% effort)
Agency: National Science Foundation
Period: 9/01/09 – 08/30/11
Amount: $249,660 Total Costs
Aim: To improve accuracy and resolution of EEG based brain imaging during walking with inclusion of subject specific head models created from magnetic resonance images

1. *EEG based imaging of motor cortical activity during human locomotion*
Principal Investigator: D. Ferris (25% effort)
Agency: National Institutes of Health
Period: 12/01/09 – 11/30/11
Amount: $408,748 Total Costs
Aim: To quantify motor cortex brain processes related to walking with a robotic exoskeleton

Extramural Training Grants for my Doctoral and Post-Doctoral Trainees (Funded)

5. *Postdoctoral Research Fellowship in Biological Informatics* (post-doctoral fellowship)
Principal Investigator: Monica Daley, PhD (D. Ferris, mentor)
Agency: National Science Foundation (BIO-0630664)
Period: 10/01/06 – 09/31/08
Amount: $120,000 Total Costs
Aim: To build a neuromechanical computer simulation of a running biped

4. *Self-Assisted Neurological Rehabilitation* (pre-doctoral fellowship)
Principal Investigator: Helen Huang (D. Ferris, mentor)
Agency: National Institutes of Health (F31 NS056504)
Period: 06/09/06 – 06/08/09
Amount: $100,152 Total Costs
Aim: To determine if recumbent stepping has therapeutic effects on spinal cord injury subjects.

3. *Upper Limb Control of Robotic Lower Limb Assistance during Walking* (post-doctoral fellowship)
Principal Investigator: Cara Lewis, PT, PhD (D. Ferris, mentor)
Agency: National Institutes of Health (F32 HD055010)
Period: 07/09/07– 07/08/09
Amount: $96,472 Total Costs
Aim: To build and test an upper limb controller for robotic lower limb assistance.

2. *Effects of Physical Assistance on Walking Balance* (pre-doctoral fellowship)
Principal Investigator: Antoinette Domingo, PT (D. Ferris, mentor)
Agency: National Institutes of Health (F31 HD056588)
Period: 06/01/07– 05/30/09
Amount: $56,884 Total Costs
Aim: To determine how physical assistance affects motor learning of walking balance.

1. *Symmetry-Based Resistance for Stroke Rehabilitation* (pre-doctoral fellowship)
Principal Investigator: Ann Simon (D. Ferris, mentor)
Agency: American Heart Association
Period: 09/01/07– 10/31/08
Amount: $51,139 Total Costs
Aim: To determine if symmetry-based resistance control of lower limb exercise can improve functional ability in post-stroke subjects.

Intramural Grants Funded (Completed)

4. *Powered Lower Limb Orthoses for Stroke Rehabilitation*
Principal Investigator: Daniel Ferris (0% effort)
Agency: University of Michigan OVPR and Rackham Graduate School
Period: 05/01/07 – 8/31/07
Amount: $4,000 Total Costs
Aim: To collect pilot data on stroke subjects wearing powered orthoses for gait rehabilitation.

3. *Apparatus and Preliminary Data for an Interdisciplinary Project in Self-Teleoperated Stabilization*
Principal Investigator: Jessy Grizzle (Daniel Ferris, Co-Investigator, 5% effort)
Agency: University of Michigan Office of the Vice President for Research
Period: 5/1/03 – 4/30/04
Amount: $10,000 Total Costs
Aim: To build a tele-operated device for studying control of human standing.

2. *Artificial Neural Oscillator Control of Functional Electrical Stimulation during Gait Rehabilitation after Spinal Cord Injury*
Principal Investigator: Daniel Ferris (5% effort)
Agency: University of Michigan Rackham Graduate School
Period: 1/1/02 – 12/31/02
Amount: $14,944 Total Costs
Aim: To test the efficacy of artificial neural oscillators as adaptive controllers.

1. *Powered Lower Limb Orthoses for Gait Rehabilitation*
Principal Investigator: Daniel Ferris (5% effort)
Agency: University of Michigan Office of the Vice President for Research
Period: 10/1/01 – 9/30/02
Amount: $12,000 Total Costs
Aim: To build a pneumatically powered knee-ankle-foot orthosis.

Scholarships, Fellowships, and Honors

Florida Academic Scholar Scholarship, 1989-1992
National Merit Scholar Scholarship, 1989-1992
Department of Exercise and Sport Sciences Fellowship, 1992-1994
University of California Regents Fellowship, 1994-1995
Department of Defense Graduate Fellowship Honorable Mention, 1994
NSF Graduate Fellowship Honorable Mention, 1995
NASA Graduate Student Researcher's Program Fellowship, 1995-1998
APS Graduate Student Award Finalist, Integrative Biology of Exercise, 1996
NIH Institutional Post-Doctoral Research Fellowship, 1998-2000
NIH Individual Post-Doctoral Research Fellowship, 2000-2001
International Society of Biomechanics Promising Young Scientist Runner-Up, 2003
NSF CAREER Award, 2003
Invited Participant for "Summit of Experts in Biomechanics" sponsored by U.S. National Committee of Biomechanics, 2007
2nd Place, Best Oral Presentation, American Spinal Injury Association Annual Meeting, 2008

Invited Presentations

Brain Research Institute, UCLA, Nov 1997
Department of Exercise Science, UC Davis, Feb 1998
Department of Exercise and Sport Science, Oregon State University, Apr 1998
Department of Exercise Science and Physical Education, Arizona State University, Feb 1999
School of Health Sciences, Deakin University - Melbourne, Australia, Feb 1999
Department of Exercise and Movement Science, University of Oregon, Mar 1999
Department of Exercise and Sport Sciences, University of Florida, Jan 2000
Motor and Locomotion Control group, University of Southern California, Feb 2000
Division of Kinesiology, University of Michigan, Mar 2000
VA Center for Excellence in Limb Loss Prevention and Prosthetic Engineering, Seattle VA, Aug 2000
Daniel Laboratory, Department of Zoology, University of Washington, Oct 2000
Center for Ergonomics, Department of Industrial and Operations Engineering, University of Michigan, Oct 2001
Department of Biomedical Engineering, University of Michigan, Dec 2001
Department of Physical Medicine and Rehabilitation, University of Michigan, Apr 2002
Orthopaedic Research Laboratories, Department of Surgery, University of Michigan, May 2002
School of Biomedical Engineering & Sciences, Virginia Tech-Wake Forest University, April 2003
Department of Kinesiology, University of Toledo, May 2003 (Keynote for Graduate Research Day)
Department of Biomedical Engineering, University of Michigan, Oct 2003
School of Applied Physiology, Georgia Institute of Technology, Aug 2004
Department of Mechanical Engineering, Drexel University, Oct 2004
National Rehabilitation Hospital, Washington DC, Jan 2005
Department of Biokinesiology and Physical Therapy, University of Southern California, Feb 2005
Department of Kinesiology, Arizona State University, Feb 2005
Department of Integrative Physiology, University of Colorado at Boulder, Mar 2005
Department of Biomedical Engineering, University of Michigan, Oct 2006
Undergraduate Research Opportunity Program, University of Michigan, Nov 2006
Department of Physical Medicine and Rehabilitation, University of Michigan, Nov 2006
Institute for Neural Computation, UC San Diego, Dec 2006
Summit of Experts in Biomechanics, U.S. Nat. Committee on Biomechanics, Keystone, CO, June 2007
12th World Congress for the International Society of Prosthetics and Orthotics, Vancouver, BC, Aug 2007
5th Scientific Meeting of the Neurorehabilitation and Reconstructive Neurosurgery Committee of the World Federation of Neurosurgical Societies, Taipei, Taiwan, Sept 2007

Department of Physical Therapy, National Taiwan University, Taipei, Taiwan, Sept 2007
Department of Biomedical Engineering, Wake Forest University, Dec 2007
Engineering, Neuroscience & Health Seminar Series, University of Southern California, Apr 2008
International Workshop on Biomimetic Complex System Design, Korea Advanced Institute of Science and Technology (KAIST), June 2008
Mexican National Congress on Biomechanics, Tecnológico de Monterrey, Leon, Mexico, June 2008 (Keynote)
Swartz Center for Computational Neuroscience, UC San Diego, June 2008
Dynamics of Biomechanical Processes Symposium, Society of Engineering Science 45th Annual Technical Meeting, University of Illinois at Urbana-Champaign, Oct 2008 (Keynote)
Workshop on Robotic Lower Limb Exoskeletons, IEEE RAS / EMBS International Conference on Biomedical Robotics and Biomechatronics, Scottsdale, AZ, Oct 2008
Southeastern Meeting of the American Society of Biomechanics, Gainesville, FL, Apr 2009 (Keynote)
Symposium on Robotic Lower Limb Exoskeletons, Annual Meeting of the American College of Sports Medicine, Seattle, WA, May 2009
Annual Meeting of the American Society of Biomechanics, State College, PA, Aug 2009 (Tutorial)

Presentations at Scientific Meetings (only works submitted as presenting author listed)

1993 American College of Sports Medicine, Seattle, WA (podium)
1995 American Society of Biomechanics, Palo Alto, CA (podium)
1996 American Physiological Society & American College of Sports Medicine Intersociety Meeting, "Integrative Biology of Exercise", Vancouver, B.C. (poster)
1997 Neural Control of Movement, Cancun, Mexico (poster)
1997 Bay Area Biomechanics Meeting, Hopkins Marine Station, Monterey, CA (podium)
1998 North American Congress on Biomechanics, Waterloo, Canada (poster)
1998 Society For Neuroscience, Los Angeles, CA (poster)
1998 Society For Neuroscience Satellite Meeting on Motor Control, Tucson, AZ (poster)
1999 Society For Neuroscience, Miami, FL (poster)
2000 Society For Neuroscience, New Orleans, LA (poster)
2001 National Center for Medical Rehabilitation Research Symposium, "Medical Rehab on the Move: Spotlight on BioEngineering", National Institutes of Health, Bethesda, MD (poster)
2001 American Society of Biomechanics, San Diego, CA (poster)
2002 World Congress of Biomechanics, Calgary, Alberta, Canada (podium)
2003 International Society of Biomechanics Bi-Annual Congress, Dunedin, New Zealand (podium)
2004 Christopher Reeve Paralysis Foundation Spinal Cord Symposium, Oak Brook, IL (poster)
2004 Neural Control of Movement, Sitges, Spain (panel)
2005 Neural Control of Movement, Key Biscayne, FL (panel chair)
2006 World Congress of Biomechanics, Munich, Germany (podium)
2008 American Spinal Injury Association, San Diego, CA (podium, awards session)

Teaching Experience

HUMAN BIODYNAMICS 103 Musculoskeletal Biomechanics, UC Berkeley. Spring 1995 (~40 students). Undergraduate laboratory course on human movement biomechanics.
INTEGRATIVE BIOLOGY 132L Mammalian Physiology, UC Berkeley. Spring 1996 (~40 students). Undergraduate laboratory course on principles of cellular and systemic physiology.
HUMAN BIODYNAMICS 101 Muscle Biology and Plasticity, UC Berkeley. Fall 1997 (~40 students). Undergraduate lecture and laboratory course on muscle physiology.
KINESIOLOGY 533 / BIOMEDICAL ENGINEERING 533 Neuromechanics, U. of Michigan. Fall 2001 (7 students), Fall 2003 (25 students), Fall 2005 (16 students), Winter 2007 (12 students). Graduate lecture/laboratory course on neuromechanical control of movement.
KINESIOLOGY 600 Graduate Seminar in Movement Science, U. of Michigan. Winter 2003 (11 students). Graduate course where students present their own research.

KINESLGY 616 Professional Skills for Research Scientists, U. of Michigan. Winter 2009 (22 students), Graduate course on professional skills necessary for success.

MOVEMENT SCIENCE 330 Biomechanics of Human Movement, U. of Michigan. Winter 2002 (25 students), Fall 2002 (36 students), Winter 2003 (40 students), Winter 2004 (59 students), Winter 2005 (73 students), Winter 2006 (91 students), Fall 2006 (41 students). Undergraduate lecture and laboratory course on musculoskeletal biomechanics.

MOVEMENT SCIENCE 435 Biomechanics of Human Locomotion, U. of Michigan. Fall 2004 (19 students), Fall 2008 (14 students). Problem-based learning course on human locomotion.

Invited Lectures, U. of Michigan. Undergraduate and graduate courses in Biomedical Eng., Industrial & Operations Eng., Mechanical Eng., and Kinesiology.

Service

University of Michigan Committee and Supervisory Duties

Member of Kinesiology Executive Committee, 2009
Member of Kinesiology Graduate Committee, 2002-present
Chair of Kinesiology Graduate Committee, 2006-present
Member of Kinesiology Computer Disk Space Committee, 2002-present
Temporary Supervisor of Kinesiology IT Staff, Summer 2003
Chair of Athletic Training Faculty Search Committee, 2003-2004
Co-Chair of Biomechanics Faculty Search Committee, 2005-2006
Faculty Advisor, Men's Club Volleyball Team, 2005-present
Faculty Advisor, Women's Club Volleyball Team, 2008-present
Member of Biomechanics Committee for Biomedical Engineering Undergraduate Curriculum, 2003
Member of Sport Injury Prevention Center Director Search Committee, 2007
Advisory Board Member, University of Michigan Model Spinal Cord Injury Care System, 2003-pres.
CIC Kinesiology Diversity Summit Participant, Nov 2008

Community Outreach Presentations

Conference on Exercise for Individuals with Spinal Cord Injury for patients and clinicians, Model Spinal Cord Injury Center, University of Michigan, September 2002
MedRehab Physical Therapy, University of Michigan Health System, May 2003
Health Sciences Scholars Program, University of Michigan, Mar 2005
Health Sciences Scholars Program, University of Michigan, Jan 2006
Physical Therapy, Chelsea Community Hospital, Chelsea, MI, Aug 2006
Investing in Ability Week, University of Michigan, Oct 2006
Health Sciences Scholars Program, University of Michigan, Mar 2007
Health Sciences Scholars Program, University of Michigan, Oct 2008
Women in Science and Engineering, University of Michigan, Nov 2008
Campus Parents' Day (Featured Faculty Lecture), University of Michigan, Nov 2008
Biomedical Engineering Society, University of Michigan, Apr 2009
Amaizin' Blue Preview Lecture Series, University of Michigan, Apr 2009
Department of Neurology Residents Lecture Series, University of Michigan, May 2009
Department of Neurology Residents Lecture Series, University of Michigan, June 2009
M-STEM Academy, College of Engineering, University of Michigan, July 2009

Professional Societies

Member, American Society of Biomechanics (ASB), 1995-present
Membership Committee, 2002-2005
Abstract Reviewer for Annual Meeting, 2003
Nominating Committee, 2006
Annual Meeting Program Committee, 2006
Awards Committee, 2007
Member, American Physiological Society (APS), 1996-present

Member, Neural Control of Movement Society (NCM), 1997-present
Member, Society for Neuroscience (SFN), 1997-present
Member, International Society of Biomechanics (ISB), 2007-present
Awards Chair, 9th International Conference on Rehabilitation Robotics (ICORR), 2005
Program Committee, IEEE Biorob Conference, 2008

Grant Applications Reviewer

American Society of Biomechanics
Michael Smith Foundation for Health Research
National Institutes of Health [Geriatrics and Rehabilitation Medicine (GRM) study section, 2 times; Musculoskeletal Rehabilitation Sciences (MRS) study section, 5 times; Collaborations with National Centers for Biomedical Computing (ZRG1 BST-E 50) study section, 5 times]
National Science Foundation (BES panel)
Department of Veterans Affairs
University of Michigan Office of Vice Provost for Research
U.S. Civilian Research and Development Foundation
U.S. Army Medical Research and Materiel Command

Manuscript Reviewer

Brain Research
Canadian Journal of Applied Physiology
Clinical Biomechanics
Computers in Biology and Medicine
European Journal of Applied Physiology
European Journal of Neuroscience
Exercise and Sport Sciences Reviews
Experimental Brain Research
Gait and Posture
IEEE Transactions on Biomedical Engineering
IEEE Transactions on Neural Systems and Rehabilitation Engineering
IEEE Transactions on Robotics
IEEE Transactions on Mechatronics
IEEE Transactions on Systems, Man and Cybernetics, Part A: Systems and Humans
IET Control Theory & Applications
International Journal of Robotics Research
Journal of Applied Biomechanics
Journal of Applied Physiology
Journal of Biomechanical Engineering
Journal of Biomechanics
Journal of Experimental Biology
Journal of Morphology
Journal of Motor Behavior
Journal of Neuroengineering and Rehabilitation
Journal of Neurologic Physical Therapy
Journal of Neurophysiology
Journal of Rehabilitation Research and Development
Medicine and Science in Sports and Exercise
Neurorehabilitation and Neural Repair
Proceedings of the Royal Society of London: Biological Sciences
Scandinavian Journal of Medicine & Science in Sports
Science
Stroke

Editorial Boards

Associate Editor, Journal of Neuroengineering and Rehabilitation, 2007-pres.
Associate Editor, Exercise and Sport Sciences Reviews, 2008-2010

External Reviewer for Promotion and/or Tenure

Department of Systems Design Engineering, University of Waterloo (declined invitation)
Department of Applied Physiology and Kinesiology, University of Florida (declined invitation)
Department of Integrative Physiology, University of Iowa
Department of Physical Therapy, University of Florida
Department of Mechanical Engineering, University of British Columbia

Mentoring Experience

Post-Doctoral Scholars:

Amy Sipp, Ph.D. (2008-present) National Institutes of Health T32 NRSA Post-Doctoral Fellow

Cara Lewis, Ph.D., P.T. (2006-2009) National Institutes of Health NRSA Post-Doctoral Fellow, National Institutes of Health T32 NRSA Post-Doctoral Fellow; starts a tenure track faculty position as an Assistant Professor in the Department of Physical Therapy at Boston University in September 2009

Monica Daley, Ph.D. (2006-2008) National Science Foundation Bioinformatics Post-Doctoral Research Fellow; currently a tenure track faculty member at the Royal Veterinary College in London, England

Doctoral Students:

Keith Gordon, Ph.D. (Kinesiology, 2001-2005); currently a post-doctoral fellow at the Rehabilitation Institute of Chicago, IL

Greg Sawicki, Ph.D. (Kinesiology & Mechanical Engineering dual Ph.D. degree, 2002-2007) Rackham Pre-Doctoral Fellow; currently a post-doctoral fellow at Brown University Department of Ecology and Evolutionary Biology; starts a tenure track position as an Assistant Professor in the Department of Biomedical Engineering at University of North Carolina, Chapel Hill in September 2009

Ann (Barkowitz) Simon, Ph.D. (Biomedical Engineering, 2005-2008) National Science Foundation Graduate Research Fellow, American Heart Associate Pre-Doctoral Fellow, Rackham Merit Fellow; currently a post-doctoral fellow at the Rehabilitation Institute of Chicago, IL

Pei-Chun Kao, P.T., Ph.D. (Kinesiology, 2004-2009) currently a post-doctoral fellow at the University of Delaware Department of Physical Therapy

Helen Huang, Ph.D. (Biomedical Engineering, 2004-2009) National Institutes of Health NRSA Pre-Doctoral Fellow; currently a post-doctoral fellow at the University of Colorado Department of Integrative Physiology

Antoinette Domingo, P.T. (Kinesiology, 2003-2009) Rackham Merit Fellow, Rackham Pre-Doctoral Fellow, National Institutes of Health NRSA Pre-Doctoral Fellow, Foundation for Physical Therapy PODS II Scholar

Stephen Cain (Biomedical Engineering, 2005-2008) National Science Foundation Graduate Research Fellow; currently a doctoral student in Biomedical Engineering at the University of Michigan

Michael Cherry (Mechanical Engineering, 2005-2009) National Science Foundation Graduate Research Fellow (co-advising with Prof. Kota from Dept. of Mechanical Engineering)

Joseph Gwin (Kinesiology, 2008-present) National Defense Science and Engineering Fellow

Sasha Voloshina (Kinesiology, 2008-present) Rackham Merit Fellow

Evelyn Anaka (Kinesiology, 2009-present)

Julia Kline (Biomedical Engineering, 2009-present) Rackham Merit Fellow

Stephanie Huang (Biomedical Engineering, 2009-present)

Doctoral Student Research Rotations:

Ugo Buzzi (Kinesiology, Fall 2003-Winter 2004); graduated with J.D. from Michigan State University, currently a district attorney in Chicago
Chris Mendias (Physiology, Winter 2004); currently a post-doctoral fellow at University of Michigan
Chia-Lin Chang (Kinesiology, Winter 2004); currently a post-doctoral fellow at University of Pittsburgh

Master's Students:

Tiffany Viant (Biomedical Engineering, 2001-2002); currently working as a biomedical engineer in southeast Michigan
Mekayla Beaver (Biomedical Engineering, 2002); currently working as a consulting engineer at IDEO in Boston, MA
Pei-Chun Kao, P.T. (Kinesiology, 2002-2003); currently a doctoral student in Kinesiology at UM
Elena Marin (Mechanical Engineering, 2002-2003); currently working as a design engineer for a defense company in Washington, DC
Helen Huang (Biomedical Engineering, 2002-2004); currently a doctoral student in Biomedical Engineering at UM
Ann Barkowitz (Biomedical Engineering, 2003-2005); currently a post-doctoral research at Rehabilitation Institute of Chicago, IL
Stephen Cain (Mechanical Engineering, 2004-2005); currently a doctoral student in Biomedical Engineering at UM
Evan Pelc (Biomedical Engineering, 2006-2007); currently in medical school at Michigan State University

Undergraduate Students: 6 Underrepresented Minority Students, 10 Female Engineering Students, 11 Female Science Students; *UROP = Undergraduate Research Opportunity Program

Eileen Hidayetoglu (Elec. Eng., UROP* & Summer Biomedical Research Fellow, 2001-2003)
Matt Walker (Mech. Eng., UROP*, 2001-2002)
Ugo Okwumabua (Mech. Eng., Summer Minority Engineering Research Fellow, 2002- 2003)
Idy Usoro (Elec. Eng., Summer Minority Engineering Research Fellow, 2002)
Sara Johnson (Mech. Eng., 2002)
Heather Feldhusen (Movement Science, 2002)
John Green (Movement Science, 2002-2003)
Tanisha Tate (Biology, UROP*, 2002-2003)
Melissa Thelen (Indust.. & Oper. Eng., 2002-2003)
Sam Liang (Elec. Eng., 2002-2003)
Annie Zuzelski (Biomed. Eng., Marian Sarah Parker Scholar, 2003)
Sarah Allen (Movement Science, 2003)
Torre Finzel (Movement Science, 2003)
Julie van Helden (Biomed. Eng., Marian Sarah Parker Scholar, 2003)
Kate Havens (Biomed. Eng., Marian Sarah Parker Scholar, 2003-2004)
Theo Van Dam (Elec. Eng., 2004)
Alexis Ball (Elec. Eng., 2004)
Zaineb Bohra (Movement Science, 2004-2005)
Kristin Roberts (Movement Science, 2004-2005)
Becca Stoloff (Mech. Eng., Marian Sarah Parker Scholar, 2004-2007)
Sarah Lucey (Movement Science, UROP*, 2004-2005)
Jamie Lukos (Movement Science, 2004-2005)
Evan Pelc (Biomed. Eng., Summer Engineering & Physical Sciences Research Fellow, 2005-2006)
Jose Mainardi (Mech. Eng., UROP*, 2005)
Tom Serbowicz (Mech. Eng., UROP*, 2005-2006)
Sabrina Silver (Movement Science, 2006-2008)
Sasha Voloshina (Biomed. Eng., Marian Sarah Parker Scholar, 2006-2007)
Allison Fersko (Movement Science, 2006-2008)

Kurt Sieloff (Biomed. Eng., 2007-2009)
Alex Duryea (Biomed. Eng., 2007)
Kelly Woznicki (Movement Science, 2007-2008)
Kristin Carroll (Movement Science, 2008-2009)
Dan Tyrrell (Movement Science, 2008-2009)
Elisabeth Rayos (Movement Science, 2009)
Sarah Weiss (Movement Science, 2009)
Daniela Weiss (Movement Science, 2009)
Ryan Bernstein (Biomed. Eng., 2009)

Graduate Student Committees

Doctoral Guidance Committee:
Keith Gordon, Kinesiology, 2001-2003
Jason Scibek, Kinesiology, 2001-2003
Ugo Buzzi, Kinesiology, 2002-2004
Dann Goble, Kinesiology, 2002-2004
Gregory Sawicki, Kinesiology, 2002-2004
Antoinette Domingo, Kinesiology, 2003-2005
Joaquin Anguera, Kinesiology, 2004-2005
Julia Looper, Kinesiology, 2004-2005
Chia-Lin Chang, Kinesiology, 2004-2005
Pei-Chun Kao, Kinesiology, 2004-2006
Joseph Gwin, Kinesiology, 2008-present
Sasha Voloshina, Kinesiology, 2008-present

Qualifying Examination Committee (Exam Date)
Thomas Withrow, Biomedical Engineering, 2003
Jesse Dean, Biomedical Engineering, 2003
Keith Gordon, Kinesiology, 2003
Jason Scibek, Kinesiology, 2003
Dann Goble, Kinesiology, 2004
Gregory Sawicki, Kinesiology, 2004
Chris Mendias, Physiology, 2004
Greg Gage, Biomedical Engineering, 2004
Jiro Doke, Mechanical Engineering, 2004
Antoinette Domingo, Kinesiology, 2005
Chia-Lin Chang, Kinesiology, 2005
Joaquin Anguera, Kinesiology, 2005
Helen Huang, Biomedical Engineering, 2005
Julia Looper, Kinesiology, 2005
Pei-Chun Kao, Kinesiology, 2006
Annie Simon, Biomedical Engineering, 2006
Manuel Hernandez, Biomedical Engineering, 2006
Shawn O'Connor, Biomedical Engineering, 2007
Steve Cain, Biomedical Engineering, 2007
Michael Cherry, Mechanical Engineering, 2008

Doctoral Dissertation Committee (Defense Date)
Jefferson Streepey, Kinesiology, 2003
Jesse Dean, Biomedical Engineering, 2005
Alaa Ahmed, Biomedical Engineering, 2005
Thomas Withrow, Biomedical Engineering, 2005
Keith Gordon, Kinesiology, 2005 (Chair)

Jun Ho Choi, Electrical Engineering, 2005
Jaebum Son, Mechanical Engineering, 2006
Jiro Doke, Mechanical Engineering 2006
Chia-Lin Chang, Kinesiology, 2007
Gregory Sawicki, Kinesiology & Mechanical Engineering, 2007 (Chair)
David Wagner, Industrial and Operations Engineering, 2007
Ben Morris, Electrical Engineering, 2007
Jesse Norris, Biomedical Engineering (Wake Forest/Virginia Tech), 2007
Peter Adamczyk, Mechanical Engineering, 2008
Julia Looper, Kinesiology, 2008
Kari Danek, Mechanical Engineering, 2008
Annie Simon, Biomedical Engineering, 2008 (Chair)
Helen Huang, Biomedical Engineering, 2009 (Chair)
Pei-Chun Kao, Kinesiology, 2009 (Chair)
Antoinette Domingo, Kinesiology, 2009 expected (Chair)
Michael Cherry, Mechanical Engineering, 2009 expected (Co-Chair)