

## JAMES J. ABBAS, PH.D.

### CONTACT INFORMATION

Address: Center for Adaptive Neural Systems  
PO Box 874404, Arizona State University  
Tempe, AZ 85287-4404

Telephone: 480-965-9521 (w)

Email: jimmy.abbas@asu.edu

Citizenship: USA

### EDUCATION

**Ph.D., Biomedical Engineering, 1992.**

Case Western Reserve University, Cleveland, OH

Thesis title: *Neural Network Control of Functional Neuromuscular Stimulation Systems.*

Advisor: Howard J. Chizeck, ScD

**M.S., Biomedical Engineering, 1989.**

Case Western Reserve University, Cleveland, OH

Thesis title: *Feedback Control of Coronal Plane Hip and Trunk Angles in Paraplegic Subjects Using Functional Neuromuscular Stimulation.*

Advisor: Howard J. Chizeck, ScD

**Sc.B., Bio-electrical Engineering, 1982.**

Brown University, Providence, RI

### PROFESSIONAL INTERESTS

Neurorehabilitation in spinal cord injury, Parkinson's disease, cerebral palsy.

Neural interfaces for prosthetic systems and neuromuscular stimulation.

Technology to promote neural plasticity.

Adaptive biomimetic system design.

Technology for Global Health.

### EXPERIENCE

Aug '02 - present

**Director and Co-Founder.**

Center for Adaptive Neural Systems

(formerly Center for Rehabilitation Neuroscience and Rehabilitation Engineering;  
co-directed with Ranu Jung through 2010)

Arizona State University, Tempe, AZ.

Aug '02 - present

**Associate Professor.**

School of Biological and Health Systems Engineering

(formerly Harrington Department of Bioengineering)

Arizona State University, Tempe, AZ.

- Jan '10 - present      **Member, Graduate Faculty.**  
Graduate Program in Mechanical Engineering  
School of Mechanical, Aerospace, Chemical & Materials Engineering  
Arizona State University, Tempe, AZ.
- Aug '08 - present      **Member, Graduate Faculty.**  
Interdisciplinary Graduate Program in Neuroscience  
Arizona State University, Tempe, AZ.
- Sept. '00 - present      **Vice President and Co-Founder.**  
customKYnetics, Inc., Lexington, KY.
- Aug '02 – Aug '08      **Director of Clinical Rehabilitation Engineering.**  
Department of Clinical Neurobiology and Bioengineering  
Banner Good Samaritan Medical Center, Phoenix, AZ.
- Aug '02 – Aug '04      **Adjunct Associate Professor.**  
Center for Biomedical Engineering  
University of Kentucky, Lexington, KY.
- July '00 – Aug. '02      **Associate Professor.**  
Center for Biomedical Engineering  
University of Kentucky, Lexington, KY.
- July '00 - Aug. '02      **Joint Appointment as Associate Professor.**  
Department of Physical Medicine & Rehabilitation  
University of Kentucky, Lexington, KY.
- Nov '00 - Aug. '02      **Affiliated Faculty.**  
Spinal Cord and Brain Injury Research Center  
University of Kentucky, Lexington, KY.
- Aug. '95 - June '00      **Assistant Professor.**  
Center for Biomedical Engineering  
University of Kentucky, Lexington, KY.
- Aug. '95 - June '00      **Joint Appointment as Assistant Professor.**  
Department of Physical Medicine & Rehabilitation  
University of Kentucky, Lexington, KY.
- Aug. '93 - Aug. '95      **Assistant Professor of Biomedical Engineering.**  
Department of Mechanical Engineering  
The Catholic University of America, Washington, DC.
- Sept. '92 - Aug. '93      **Adjunct Assistant Professor.**  
Systems Engineering Department  
Case Western Reserve University, Cleveland, OH.
- Sept. '92 - July '93      **Biomedical Engineer.**  
Research Department  
Shriners Hospital, Philadelphia, PA.

May '86 - Aug. '92     **Biomedical Research Engineer.**  
 Motion Study Laboratory  
 Cleveland Veterans Administration Medical Center, Cleveland, OH.

Oct.'85 - May '86     **Research Assistant.**  
 Rehabilitation Engineering Center  
 Metropolitan General Hospital, Cleveland, OH.

July '82 - Oct. '84     United States Peace Corps.  
**Teacher,**  
 Marymount Secondary School, Mzuzu, Malawi.  
**Public Health Worker,**  
 Chitipa District Hospital, Chitipa, Malawi.

**GRANTS AND FELLOWSHIPS RECEIVED**

*Effective and Reliable Peripheral Interfaces for Prosthetic Control*

Defense Advanced Research Projects Agency (DARPA)  
 N660001-12-C-4195    01/24/12- 01/23/13;     \$499,233  
 PI:                         Ranu Jung, Ph.D (Florida International University)  
 co-Investigators:     Kenneth Horch  
                                   Jorge Orbay, MD  
**Consultants:**       **James J. Abbas, PhD** (Center for Adaptive Neural Systems/BME, ASU)  
                                   Michael Pack, CPO (Artificial Limb Specialists)

*Neural-enabled Prostheses for Sensorimotor Integration*

NIH-National Institute of Biomedical Imaging and Bioengineering  
 R01-EB008578        09/30/07- 06/30/12;     \$3,281,759  
 PI:                         Ranu Jung, Ph.D (Florida International University)  
 co-Investigators:     Kenneth Horch (Biomedical Engineering)  
                                   Jorge Orbay, MD (Surgery)  
**PIs on subcontracts:** **James J. Abbas, PhD** (Center for Adaptive Neural Systems/BME, ASU)  
                                   James Patrick, Cochlear Ltd., Australia  
                                   Harold Sears, PhD, Motion Control, Inc., Utah, USA

*Effective and Reliable Peripheral Neural Interfaces*

Defense Advanced Research Projects Agency (DARPA)  
 N660001-12-C-4195    01/24/12- 01/23/13;     \$499,233  
 PI:                         Ranu Jung, Ph.D (Florida International University)  
 co-Investigators:     Kenneth Horch  
                                   Jorge Orbay, MD  
**Consultants:**       **James J. Abbas, PhD** (Center for Adaptive Neural Systems/BME, ASU)  
                                   Michael Pack, CPO (Artificial Limb Specialists)

*Exercise Training in Parkinson's Disease: Neural and Functional Benefits*

NIH-NICHD-National Center for Medical Rehabilitation Research

R21 09/23/2008 - 08/31/2012 \$495,525

PI: Narayanan Krishnamurthi, PhD (Center for Adaptive Neural Systems)

co-Investigators: **James J. Abbas, PhD** (Center for Adaptive Neural Systems/BME)

Wayne Willis, PhD (Kinesiology, ASU)

Holly Shill, MD (Sun Health Research Institute)

Kewei Chen, PhD (Banner Good Samaritan Medical Center)

Padma Mahant, MD (Banner Good Samaritan Medical Center)

Johan Samanta, MD (Banner Good Samaritan Medical Center)

Abraham Lieberman, MD (Barrow Neurological Institute)

*Stimulation-Augmented Exercise and Neuromotor Therapy*

Subcontract on Phase II SBIR to customKYnetics, Inc. from NIH-NICHD

NIH R44-HD050006 04/01/2008-03/31/2012; subcontract budget: \$88,698

PI on SBIR grant: Eric Hartman, MS (customKYnetics, Inc.)

**PIs on subcontracts:** **James J. Abbas, PhD** (Center for Adaptive Neural Systems/BME)

Denise Campagnolo, MD (Barrow Neurological Institute)

Edee Field-Fote, PhD, PT (Miami Project to Cure Paralysis)

*Improving orthostatic tolerance after spinal cord injury*

Paralyzed Veterans of America

Award: 2546 02/01/2008 - 01/31/2011 \$150,000

PI: Narayanan Krishnamurthi, PhD (Center for Adaptive Neural Systems)

co-Investigators: **James J. Abbas, PhD** (Center for Adaptive Neural Systems/Bioeng.)Denise Campagnolo (Center for Adaptive Neural Systems;  
Barrow Neurological Institute)*Adaptive Electrical Stimulation for Locomotor Retraining*

NIH-NICHD-National Center for Medical Rehabilitation Research

R01-HD049773 08/01/2005-04/30/2011; \$868,573

**PI:** **James J. Abbas, Ph.D.** (Center for Adaptive Neural Systems/Bioeng.)

co-Investigator: Ranu Jung, Ph.D.

*Adaptive Stimulator for Exercise and Rehabilitation*

Subcontract on Phase II SBIR to customKYnetics, Inc. from NIH-NICHD-NCMRR

R44-HD41820 07/01/04-06/30/09; subcontract budget: \$234,885

PI on SBIR grant: Eric Hartman, MS (customKYnetics, Inc.)

**PI on subcontract:** **James J. Abbas, PhD***CRCNS-Modeling Neuromusculoskeletal Alterations After Spinal Cord Injury*

NIH-NSF Joint Program; National Institute of Neurological Disorders &amp; Stroke

R01-NS10021029 7/1/05-7/31/10, \$1,314,799

PI: R. Jung, Ph.D. (Center for Adaptive Neural Systems/Bioeng.)

**co-Investigator:** **James J. Abbas, Ph.D.** (Center for Adaptive Neural Systems/Bioeng.)

Co-I: A. Razdan, Ph.D. (PRISM/Computer Science)

Sub-contract: T. Hamm, Ph.D. (Barrow Neurological Institute)

Sub-contract: G. Yamaguchi, Ph.D. (E<sup>x</sup>ponent, Inc.)  
 Sub-contract: V. Booth, Ph.D. (U. Michigan, Mathematics).

*Catalyst- Center of Excellence for Adaptive Neuro-Biomechatronic Systems (CEANS)*

National Science Foundation

SBE-0518697 07/01/05-06/30/08; \$133,118

PI: Ranu Jung, Ph.D. (Center for Adaptive Neural Systems/Bioeng.)

**co-Investigators:** **James J. Abbas, Ph.D.** (Center for Adaptive Neural Systems/Bioeng.)

Carlos Castillo-Chavez (Mathematics)

Sharon Crook (Mathematics)

Antonio Garcia (Bioengineering)

Lokesh Joshi (Biodesign/Bioengineering)

Yang Kuang (Mathematics)

Stephen Phillips (Electrical Engineering)

Anshuman Razdan (PRISM)

Marco Santello (Kinesiology/Bioengineering)

Joseph Wang (Biodesign/Chem. & Materials Engineering/ Chemistry)

*Neuromorphic Control System for Powered Limb Splints*

Subcontract on Phase II STTR to AdveNSys, LLC from US Army

W911NF-05-C-0122 09/28/05-03/31/08 subcontract budget: \$225,805

PI on STTR: R. Jung, Ph.D.

Co-I on STTR: V. Jung, MBA (AdveNSys, LLC)

**PI on subcontract:** **James J. Abbas, Ph.D.** (Center for Adaptive Neural Systems/Bioeng.)

*Force Modulation Training in Children with Cerebral Palsy*

NIH- National Institute of Neurological Disorders & Stroke

F31-NS053010 09/01/05-08/31/08; \$90,000

PI: Andrea Downing (Center for Adaptive Neural Systems/Bioeng.)

(Ruth Kirschstein Individual NRSA pre-doctoral fellowship)

**Mentor:** **James J. Abbas, PhD** (Center for Adaptive Neural Systems/Bioeng.)

*Stimulation-Augmented Exercise and Neuromotor Therapy*

Subcontract on Phase I SBIR to customKYnetics, Inc. from NIH-NICHD

NIH R43-HD050006 4/1/06-10/31/07; subcontract budget: \$32,630

PI on SBIR grant: Eric Hartman, MS (customKYnetics, Inc.)

**PI on subcontract:** **James J. Abbas, PhD** (Center for Adaptive Neural Systems/Bioeng.)

*Neuromorphic Control System for Powered Limb Splints*

Subcontract on Phase I STTR to AdveNSys, LLC from US Army

W911NF-04-L-0071; 08/01/04-01/31/05; subcontract budget: \$31,515

PI on STTR: Ranu Jung, Ph.D.

Co-Investigator: Vikram Jung, MBA (AdveNSys, LLC)

**PI on subcontract:** **James J. Abbas, Ph.D.** (Center for Adaptive Neural Systems/Bioeng.)

*A Rodent Model for Locomotor Training with FNS*

NIH-NICHD-National Center for Medical Rehabilitation  
 R01-HD40335 01/01/02–12/31/04; \$781,920  
 PI: Ranu Jung, PhD (Center for Biomedical Engineering, U. of Kentucky)  
**co-Investigators:** **James J. Abbas, PhD** (Center for Biomedical Engineering)  
 Steve Scheff, PhD (Anatomy & Neurobiology)

*Customized Electrical Stimulation for SCI Rehabilitation*

Subcontract on Phase II SBIR grant to customKYnetics, Inc. from NIH-NICHD-NCMRR  
 R44-HD39013 09/01/02–08/31/04, subcontract budget: \$65,000  
 PI on SBIR grant: Eric Hartman, MS (customKYnetics, Inc.)  
**PI on subcontract:** **James J. Abbas, PhD**  
 co-Investigators: Susan McDowell, MD (Physical Medicine & Rehabilitation)

*Electrical Stimulation for Trunk Stabilization in SCI*

Subcontract on Phase I SBIR grant to customKYnetics, Inc. from NIH-NICHD-NCMRR  
 R43-HD041286 04/01/02-09/30/02; \$27,000  
 PI on SBIR grant: Eric Hartman, MS (customKYnetics, Inc.)  
**PI on subcontract:** **James J. Abbas, PhD**  
 co-Investigators: Susan McDowell, MD (Physical Medicine & Rehabilitation)

*Adaptive Stimulator for Exercise and Rehabilitation*

Subcontract on Phase I SBIR grant to customKYnetics, Inc. from NIH-NICHD-NCMRR  
 02/01/02–07/31/02, \$17,000  
**PI on subcontract:** **James J. Abbas, PhD**  
 co-Investigators: Susan McDowell, MD (Physical Medicine & Rehabilitation)  
 PI on SBIR grant: Eric Hartman, MS (customKYnetics, Inc.)

*Preparatory Adjustments for Improved Standing with FNS*

NIH-NICHD-National Center for Medical Rehabilitation  
 R01-HD38570 05/01/00–04/31/04, \$588,488  
**PI:** **James J. Abbas, PhD**  
 co-Investigators: Jean McCrory, PhD (Kinesiology & Health Promotion)  
 David Gater, MD, PhD (Physical Medicine & Rehabilitation)  
 Susan McDowell, MD (Physical Medicine & Rehabilitation)  
 Ronald J. Triolo, PhD (Case Western Reserve University)  
 Robert F. Kirsch, PhD (Case Western Reserve University)

*Automatic Control of Standing Balance with FNS*

Sucontract on grant from NIH-National Institute for Neurological Disorders and Stroke  
 R01-NS-40547-01 07/01/00-06/30/03; subcontract budget: \$124,670  
 PI on primary: Ronald J. Triolo (Case Western Reserve University)  
**PI on subcontract:** **James J. Abbas, PhD**

*Recovery of Cardiovascular Control after Spinal Cord Injury*

Kentucky Spinal Cord & Head Injury Research Trust, 01/01/01–12/31/04, \$279,931

**PI:** James J. Abbas, PhD

co-Investigators: Joyce Evans, MS (Center for Biomedical Engineering)  
 Charles F. Knapp, PhD (Center for Biomedical Engineering)  
 Robert Taylor, MD, PhD (Cardinal Hill Rehabilitation Hospital)  
 Susan McDowell, MD (Physical Medicine & Rehabilitation)  
 David Gater, MD (Physical Medicine & Rehabilitation)  
 David Randall, PhD (Department of Physiology)  
 David Brown, PhD (Center for Biomedical Engineering)

*Implanted Neuroprostheses for Standing after SCI*

Subcontract on FDA Grant, 10/1/99-09/31/02; subcontract budget: \$92,131

PI on primary: Ronald J. Triolo (Case Western Reserve University)

**PI on subcontract:** James J. Abbas, PhD

co-Investigators: David Gater, MD, PhD (Physical Medicine & Rehabilitation)  
 Susan McDowell, MD (Physical Medicine & Rehabilitation)

*Individualizing the Design and Use of a FES-based Standing Neuroprosthesis*

Subcontract on Department of Veterans Affairs Merit Review Grant

B2105RC, 10/1/99-09/31/02; subcontract budget: \$22,000

PI on primary: Robert F. Kirsch, PhD (Case Western Reserve University)

**PI on subcontract:** James J. Abbas, PhD

*Effects of Phasic Neuromuscular Electrical Stimulation on Functional Recovery in Incomplete Spinal Cord Injury*

Kentucky Spinal Cord and Head Injury Trust, 01/01/99-12/31/00; \$124,056

**PI:** James J. Abbas, PhD

co-Investigator: Susan McDowell, MD (Physical Medicine & Rehabilitation)

*Customized Electrical Stimulation for SCI Rehabilitation*

Subcontract on Phase I SBIR grant from National Center for Medical Rehabilitation

R43-HD39013, 09/01/00–08/31/01; subcontract budget: \$30,000

**PI on subcontract:** James J. Abbas, PhD

co-Investigators: David Gater, MD, PhD (Physical Medicine & Rehabilitation)

primary contract to customKYnetics, Inc:

*Customized Electrical Stimulation for SCI Rehabilitation*

PI: Eric Hartman

*Control of Limb Position Using Functional Neuromuscular Stimulation*

Whitaker Foundation, 01/01/97-06/30/00; \$208,946

**PI:** James J. Abbas, PhD

co-Investigators: Susan McDowell, MD (Physical Medicine & Rehabilitation)  
 Bruce Walcott, PhD (Department of Electrical Engineering)

- Electrical stimulation for enhanced functional recovery in spinal cord injury*  
 Paralyzed Veterans of America, Kentucky and Indiana Chapter, 06/99, \$10,000  
**PI: James J. Abbas, PhD**
- Trunk Muscle Stimulation for Seated Posture Control in Spinal Cord Injury*  
 Univ. of Kentucky Medical Center Research Fund, 07/01/98-06/30/99; \$14,945  
**PI: James J. Abbas, PhD**  
 co-Investigators: David Gater, MD, PhD (Physical Medicine & Rehabilitation)  
 Charles F. Knapp, PhD (Center for Biomedical Engineering)
- Biomedical Engineering Approaches to Spinal Cord Injury Research (PI)*  
 The Whitaker Foundation, Conference Grant, 05/00-07/00; \$10,000  
**PI: James J. Abbas, PhD**  
 co-Investigators: Ranu Jung, PhD (Center for Biomedical Engineering)  
 James Geddes, PhD (Anatomy & Neurobiology)
- Analog VLSI-Spinal Cord Interface for Motor Control*  
 NIH-National Center for Research Resources  
 R21-RR12588 09/01/97-08/31/00; \$184,901.  
**PI: Ranu Jung, PhD (Center for Biomedical Engineering)**  
**co-Investigators: James J. Abbas, PhD**  
 Elizabeth Brauer, PhD (Northern Arizona University)
- Standing by Functional Neuromuscular Stimulation*  
 Subcontract on NIH Neural Prosthesis Contract,  
 N01-NS-6-2351 11/01/96–09/31/99, subcontract budget: \$140,636  
**PI on primary: Ronald J. Triolo, PhD (Case Western Reserve University)**  
 co-Investigators: Robert F. Kirsch, PhD (Case Western Reserve University)  
 John A. Davis, MD (Case Western Reserve University)  
 James J. Abbas, PhD  
 Scott Delp, PhD (Northwestern University)  
**PI on subcontract: James J. Abbas, PhD**  
 co-Investigator: Susan McDowell, MD (Physical Medicine & Rehabilitation)
- Metabolic Analysis in Exercise Physiology and Rehabilitation*  
 Major Research Equipment Grant, U. of Kentucky, 1997, \$27,429  
**PI: J.W. Yates, PhD (Kinesiology & Health Promotion)**  
**co-Investigators: James J. Abbas, PhD**  
 David Gater, MD, PhD (Physical Medicine & Rehabilitation)



*Design and Assessment of Assistive Technology*

Subcontract to on US Army Grant, 11/01/94-10/31/98, \$280,000

PI on subcontract: Jack Winters, PhD

**co-PI: James J. Abbas, PhD**

primary grant to the National Rehabilitation Hospital: *Assistive Technology Research Center*

US Army Medical Research and Materials Command, 10/94 – 10/98, \$4,000,000

PI: William Peterson (National Rehabilitation Hospital)

(this proposal was funded, but I could not participate due to my departure from Washington, DC)

*Adaptive Feedforward Neural Network Control System Design*

Subcontract to Catholic University on NSF Grant, 09/01/92–08/31/95; \$80,396

**PI on subcontract: James J. Abbas, PhD**

primary contract to Case Western Reserve University: *Neural Network Control of Oscillatory Movements of Multi-segmented Musculoskeletal Systems.*

NSF-BCS-9216697, 09/01/92–08/31/95; \$285,387

PI: Howard J. Chizeck, ScD

**co-PI: James J. Abbas, PhD**

*The Application of Artificial Neural Networks to Control FNS-Generated Walking in Children with Spinal Cord Injuries.*

Research Fellowship from Shriners Hospitals, 09/01/92–06/30/93, \$45,000

**Post-doctoral research fellow: James J. Abbas, PhD**

Research mentor: Ronald J. Triolo, PhD

**PEER-REVIEWED PUBLICATIONS (\* indicates students mentored)**

N. Krishnamurthi, S. Mulligan\*, P. Mahant, J. Samanta, J.J. Abbas, "Deep Brain Stimulation Amplitude Alters Posture Shift Velocity in Parkinson's Disease", to appear in *Cognitive Neurodynamics*, 2012.

R.J. Triolo, S. Nogan Bailey, M.E. Miller, L.M. Rohde, J.S. Anderson, J.A. Davis, Jr., J.J. Abbas, D.R. Gater, G.P. Forrest, L.A. DiPonio, L.J. Yang, "Longitudinal Performance of a Surgically Implanted Neuroprosthesis for Lower Extremity Exercise, Standing, and Transfers after Spinal Cord Injury", to appear in *Arch PM&R*, 2012.

M.L. Boninger, J. French, J. Abbas, L Nagy, M. Ferguson Pell, S. Johnson Taylor, M. Rodgers, N. Saunders, H. Peckham, R. Marshall, and A. Sherwood, "Technology for mobility in SCI ten years from now", *Spinal Cord*, doi:10.1038/sc.2011.165, 2012.

M. Fairchild, S.J. Kim, A. Iarkov, J.J. Abbas, R. Jung, "Repetitive hindlimb movement using intermittent adaptive neuromuscular electrical stimulation in an incomplete spinal cord injury rodent model", *Exp Neurol*. 223(2), pp. 623-33, 2010.

R. Jung, A. Belanger, T. Kanchiku, M. Fairchild, and J.J. Abbas, "Neuromuscular stimulation therapy after incomplete spinal cord injury promotes recovery of locomotor control", *J. Neural Eng.*, Vol. 6 (5), 2009.

R. Jung, K. Ichihara, G. Venkatasubramanian and J.J. Abbas, "Chronic neuromuscular electrical stimulation of paralyzed hindlimbs in a rodent model", *J. Neuroscience Methods*, 183(2), pp. 241-54, 2009.

A. Downing\*, K. Ganley, D.R. Fay, and J.J. Abbas, "Temporal characteristics of lower extremity moment generation in children with cerebral palsy", *Muscle & Nerve*, 29, pp. 800-809, 2009.

S. J. Kim, M. Fairchild, A. Iarkov, J.J. Abbas, and R. Jung, "Adaptive control of movement for neuromuscular stimulation-assisted therapy in a rodent model", *IEEE Trans. Biomed. Eng.*, Vol.56, Issue 2, pp. 452-461, 2009.

K.Ichihara, G. Venkatasubramanian, J.J. Abbas, and R. Jung. "Neuromuscular electrical stimulation of the hindlimb muscles for movement therapy in a rodent model". *J Neurosci Methods*, vol. 176, Issue 2, pp. 213-224, 2009.

J.C. Gillette, C. A. Stevermer, N.E. Quick, and J.J. Abbas, "Alternative foot placements for individuals with spinal cord injuries standing with the assistance of functional neuromuscular stimulation", *Gait and Posture*, 27 (2), pp.280-285, 2008.

T.J. Kanchiku, J.V. Lynskey, D. Protas, J.J. Abbas and R. Jung. "Neuromuscular electrical stimulation induced forelimb movement in a rodent model", *J. Neurosc. Methods*, 167(2), pp. 317-26, 2008.

J.C. Gillette and J.J. Abbas, "Foot Placement Alters the Mechanisms of Postural Control While Standing and Reaching", *IEEE Trans. Neural Systems & Rehab*, Vol. 11, No. 4, pp. 377-385, 2003.

J.C. Gillette, N.E. Quick, and J.J. Abbas, "Center of pressure measures to assess FNS standing performance" *Biomedical Sci Instrum*, pp. 239-244, 2002.

J.A. Riess, and J.J. Abbas, "Adaptive Control of Cyclic Movements as Muscles Fatigue Using Functional Neuromuscular Stimulation", *IEEE Trans. Rehab. Eng.* Vol. 9, No. 3, pp. 326-330, 2001.

J.J. Abbas and R. Riener, "Using Mathematical Models and Advanced Control Systems Techniques to Enhance Neuroprosthesis Function", *Neuromodulation*, Vol. 4, No. 4, pp. 187-195, 2001.

R. Jung, E.J. Brauer, and J.J. Abbas, "Real-time Interaction Between a Neuromorphic Electronic Circuit and the Spinal Cord", *IEEE Trans. Rehab. Eng.* Vol. 9, No. 3, pp. 319-326, 2001.

J.J. Abbas and J.C. Gillette, "Approaches to Control Standing Posture using Electrical Stimulation", *IEEE Control Systems Mag.* Vol. 21, No. 4, pp. 80-90, 2001.

E. Stites\* and J.J. Abbas "Sensitivity and Versatility of an Adaptive System for Controlling Cyclic Movements Using Functional Neuromuscular Stimulation", *IEEE Trans. Biomed. Eng.* Vol. 47, No. 9, pp. 1287-1292, 2000.

J.A. Riess\* and J.J. Abbas, "Adaptive Neural Network Control of Cyclic Movements Using Functional Neuromuscular Stimulation", *IEEE Trans. Rehab. Eng.*, Vol. 8, No. 1, pp. 42-52, 2000.

D.R. Gater, S.M. McDowell, and J.J. Abbas, "Electrical Stimulation: A Societal Perspective", *Assistive Technology*, Vol. 12, pp. 85-91, 2000.

S. Grandhe, J.J. Abbas and R. Jung, "Brain-spinal cord interactions stabilize the locomotor rhythm to an external perturbation", *Biomedical Sci Instrum*, Vol. 35, pp. 175-180, 1999.

J.J. Abbas and R.J. Triolo, "Experimental Evaluation of an Adaptive Feedforward Controller for Use in Functional Neuromuscular Stimulation Systems", *IEEE Trans. Rehab. Eng.*, Vol. 5, No. 1, pp. 12-22, 1997.

J.A. Riess\* and J.J. Abbas, "Evaluation of FNS Control Systems: Software Development and Sensor Characterization", *Biomedical Sci Instrum*, Vol. 33, pp. 197-202, 1997.

P.E. Crago, N. Lan, P.H. Veltink, J.J. Abbas and C. Kantor, "New Control Strategies for Neuroprosthetic Systems", *J. Rehab. Res. & Devel.* Vol. 33, No.2, pp.158-172, 1996.

J.J. Abbas and H.J. Chizeck, "Neural Network Control of Functional Neuromuscular Stimulation Systems: Computer Simulation Studies", *IEEE Trans. Biomed. Eng.*, Vol.42, No. 11, pp. 1117-1126, 1995.

J.J. Abbas and H.J. Chizeck, "Feedback Control of Coronal Plane Hip Angle Using Functional Neuromuscular Stimulation", *IEEE Trans. Biomed. Eng.*, Vol.38, No.7, pp. 687-698, July, 1991.

H.J. Chizeck, R. Kobetic, E.B. Marsolais, J.J. Abbas, I.H. Donner and E. Simon, "Control of Functional Neuromuscular Stimulation Systems for Standing and Locomotion in Paraplegics", *Proceedings of the IEEE*, Vol. 76, No. 9, pp. 1155-1165, Sept. 1988.

### **PATENTS (PENDING)**

"Neural Enabled Prosthesis-Communication Interface for Sensory Stimulation (NEP-CSS)". R. Jung, K. Horch, J.J. Abbas, S. Phillips, B. Bakkaloglu, S. Kim; patent pending.

"Lower extremity exercise device with stimulation and related methods", E. Hartman, J. Abbas, & J. Resig; patent pending.

"Devices for use in exercising and related methods"; E. Hartman, J. Alton, J. Resig, & J. Abbas; patent pending.

"Self-Anchoring MEMS Intrafascicular Neural Electrode"; R. Jung, S. Phillips, & J. Abbas; patent pending.

### **PEER-REVIEWED AND INVITED BOOK CHAPTERS (\* indicates students mentored)**

J.J. Abbas and A. Abraham, "Biomimetic Approaches to Physiological Control" in Biomedical Engineering Fundamentals: The Biomedical Engineering Handbook, 4<sup>th</sup> Edition, Ed. J.D. Bronzino, CRC Press, Inc., Boca Raton, FL, 2011. (*Invited Chapter*).

J.J. Abbas, "Biomimetic Adaptive Control Algorithms" in Biohybrid Systems: Nerves, Interfaces, and Machines, First Edition. Edited by Ranu Jung, Wiley-VCH Verlag GmbH & Co. KGaA., pages 141-157. 2011 (*Invited Chapter*).

J.J. Abbas, "Neural Networks for Physiological Control" in Biomedical Engineering Fundamentals: The Biomedical Engineering Handbook, 3<sup>rd</sup> Edition, Ed. J.D. Bronzino, CRC Press, Inc., Boca Raton, FL, 2006. (*Invited Chapter*).

J.J. Abbas, "Neural Networks for Physiological Control" in Handbook of Biomedical Engineering, 2<sup>nd</sup> Edition Vol II, CRC Press, Inc., Boca Raton, FL, pp. 162.1-162.10, 2000. (*Invited Chapter*).

J.J. Abbas and R.J. Full, "Neuromechanical Interaction in Cyclic Movements" in Biomechanics and Neural Control of Movement, Ed. by J.M. Winters and P.E. Crago, Springer-Verlag, pp. 177-191, 2000. (*Invited Didactic Chapter*).

Jayasundera, S.P\* and J.J. Abbas, "Control of Rhythmic Movements using FNS" in Biomechanics and Neural Control of Movement, Ed. by J.M. Winters and P.E. Crago, Springer-Verlag, pp. 632-641, 2000.

H. Dou, Z. Zhou, Y. Chen, J. Xu and J.J. Abbas, "Robust Control of Functional Neuromuscular Stimulation Systems by Discrete-time Iterative Learning" in Recent Advances in Iterative Learning Control, Ed. by Z. Bien and J. Xu, Kluwer Academic Pub., pp. 351-370, 1998, (*Invited Chapter*).

J.J. Abbas, "Using Neural Models in the Design of a Movement Control System", in Computational Neuroscience, Ed. J. Bower, Academic Press, New York, pp. 305-310, 1996.

J.J. Abbas, "Neural Networks for Physiological Control" in CRC Handbook of Biomedical Engineering, CRC Press, Inc., Boca Raton, FL, pp. 2422-2431, 1995 (*Invited Chapter*).

### **PEER-REVIEWED CONFERENCE PAPERS AND ABSTRACTS (\* indicates students mentored)**

C. Vuong\*, T. Ingalls, and J.J. Abbas, "Transforming Clinical Rehabilitation into Interactive Multimedia", *ACM Multimedia Conf.*, Scottsdale, AZ, 2011. (presentation by C. Vuong)

N. Krishnamurthi, S. Mulligan\*, P. Mahant, J. Samanta, and J. J. Abbas, "Effects of Deep Brain Stimulation on Dynamic Posture Shifts in Parkinson's Disease", *IEEE Conf. on Complex Medical Engineering*, Tempe, AZ, 2009. (platform presentation by N. Krishnamurthi)

J.J. Abbas, S.J. Kim, M. Fairchild, S. Allison, N. Krishnamurthi, and R. Jung, "On the use of adaptive control in stimulation-assisted neuromotor therapy", 13<sup>th</sup> Annual Conference of the International Functional Electrical Stimulation Society, (Frieburg, Germany), 2008. (poster presentation by J.J. Abbas)

B.K Hillen, J. Abbas, D. Jindrich, and R. Jung, "Effects of muscle strength and activation profile on foot drag in a simulated SCI rat", *Computation and Neural Systems*, Portland, OR, 2008. (Poster presentation by B.K. Hillen).

V. Pizziconi, J Snyder, K Heinrichs, J Abbas, J Peles, J He, R Jung, K Csavina, J Lynskey, R Filley, T Duenning, N Ben, W Maruwo, and M Garisyeje. "Empowering Malawians with Disabilities", BMES Annual Fall Meeting 2008 (poster presentation by V. Pizziconi).

A.L. Downing\*, K. Narayanan, and J.J. Abbas, "Postural control of self-initiated weight shifts in children and adults", *American Society of Biomechanics*, Palo Alto, CA, 2007. (poster presentation by A.L. Downing)

S.J. Kim, M. Mukherjee, A. Iarkov, J. Abbas, and R. Jung, "Adaptive Control for Neuromuscular Stimulation Therapy in an Intermittent Training Paradigm", *Biomedical Engineering Society Annual Meeting*, Los Angeles, CA, 2007. (poster presentation by S.J. Kim)

S.J. Kim, M. Mukherjee, A. Iarkov, J.J. Abbas, R. Jung. Adaptive control for neuromuscular stimulation movement therapy. 25<sup>th</sup> Annual National Neurotrauma Society Meeting. Missouri, KA 2007. (poster presentation by S.J. Kim)

A.T. Hayes\* and J.J. Abbas, "Effect of Wheelchair Seatback on Propulsion in Experienced Manual Wheelchair Users", *Proc. RESNA*, 2006 (oral presentation by A. Hayes)

T. Kanchiku, J.V. Lynskey, T. Taguchi, J.J. Abbas and R. Jung. "Rodent Model for Forelimb Neuromuscular Stimulation based Movement Therapy". pg. 274-276, 11<sup>th</sup> Annual Conference

of the International Functional Electrical Stimulation Society, (Miyagi-Zao, Japan), 2006 (Poster presentation by T. Kanchiku and R. Jung).

R. Jung, A. Belanger, T. Kanchiku, J. Lynskey, M. Mukherjee, D. Hagner, J.J. Abbas. "Hindlimb Neuromuscular Stimulation Therapy after Thoracic Contusion Injury Promotes Locomotor Recovery". pg. 118-120, 11<sup>th</sup> Annual Conference of the International Functional Electrical Stimulation Society, (Miyagi-Zao, Japan), 2006. (Oral presentation by R. Jung).

K. Ichihara, G. Venkatasubramanian, A. LaBelle, E. Ashton, J.J. Abbas, R. Jung. "Muscle stimulation in a rodent model: electrode design, implantation and assessment". Proceedings of IFESS-FESnet 2004, 9<sup>th</sup> Annual IFESS Conf. (Online: [www.ifess.org](http://www.ifess.org)), pg. 404-406, Edts. Duncan Wood, Paul Taylor, (Bournemouth, UK), 2004. (Poster presentation by R. Jung)

J.J. Abbas, J.L. Finley, J.C. Gillette, R.J. Triolo and J.A. Resig, "Standing with Functional Neuromuscular Stimulation: Effect of Foot Placement and Feedback Variables" *Proc. IEEE/EMBS*, (Cancun, Mexico), 2003. (oral presentation by J.J. Abbas)

J. L. Finley\*, J. C. Gillette, J. A. Riess, R. J. Triolo and J. J. Abbas, "Feedback signals to adjust and control standing posture", *Proc. Joint Conf. IEEE/EMBS and BMES*, (Houston, TX), 2002. (oral presentation by J.L. Finley with J.J. Abbas)

J.C. Gillette, N.E. Quick, J.L. Finley, and J.J. Abbas, "Postural Effects of Foot Placement During FNS-Assisted Standing", *Proc. IFESS Conf.* (Ljubljana, Slovenia), pp. 46-48, 2002. (oral presentation by J.C. Gillette with J.J. Abbas)

J.C. Gillette, J.A. Riess, and J.J. Abbas, "Comparison of FNS-assisted and Able-bodied Quiet Stance", *Proc. IFESS Conf.* (Cleveland, OH), pp. 268-270, 2001. (poster presentation by J.C. Gillette with J.J. Abbas).

J. Ou\*, J.A. Riess, and J.J. Abbas, "Adaptive Control of Cyclic Movements in a Multi-segment System", *Proc. IFESS Conf.* (Cleveland, OH), pp. 229-231, 2001. (oral presentation by J. Ou with J.J. Abbas).

E. Hartman\*, R.J. Triolo, and J.J. Abbas, "Adaptive Linearization of Agonist/Antagonist Muscle Systems", *Proc. IFESS Conf.* (Cleveland, OH), pp. 297-299, 2001. (poster presentation by E. Hartman with J.J. Abbas).

J.C. Gillette, J.A. Riess, A. Schwarting\*, J.L. McCrory, and J.J. Abbas, "Standing Posture During Functional Tasks: Effect of Foot Placement and Implications for FNS Standing", *Proc. IFESS Conf.* (Aalborg, Denmark), 2000. (poster presentation by J.C. Gillette with J.J. Abbas).

E. Hartman\* , J. A. Riess, R.J. Triolo and J.J. Abbas, "A Real-time Simulation System to Evaluate User-Device Interaction: An Application for Development of FNS Control Systems", *Proc. RESNA Conf.*, 2000. (oral presentation by E. Hartman\* with J.J. Abbas).

X. Zhang\*, R.J. Triolo and J.J. Abbas, "Task-dependent Adjustments to Co-stimulation Levels in Functional Neuromuscular Stimulation Systems", *Proc. IEEE/BMES Conf.*, (Atlanta, GA), pp. 658, 1999. (oral presentation by X. Zhang\* with J.J. Abbas).

E. Hartman\* , R.J. Triolo and J.J. Abbas, "Effects of System Nonlinearities on Posture Adjustments Using Functional Neuromuscular Stimulation", *Proc. IEEE/BMES Conf.*, (Atlanta, GA), pp. 659, 1999. (oral presentation by E. Hartman\* with J.J. Abbas).

P. Kataria\* and J.J. Abbas, "Adaptive User-specified Control of Movements with Functional Neuromuscular Stimulation", *Proc. IEEE/BMES Conf.*, (Atlanta, GA), pp. 604, 1999. (poster presentation by P. Kataria\* with J.J. Abbas).

J.A. Riess and J.J. Abbas "Control of Cyclic Movements as Muscles Fatigue Using Functional Neuromuscular Stimulation", *Proc. IEEE/BMES Conf.*, (Atlanta, GA), pp. 659, 1999. (oral presentation by J.A. Riess with J.J. Abbas).

E.J. Brauer, R. Jung, J.J. Abbas, B. Thompsen, S. Hilchie and A. Tran, "Experimental Results of 6 Neuron VLSI Circuit of Lamprey Unit Pattern Generator", *Proc. IEEE/BMES Conf.*, (Atlanta, GA), pp. 372, 1999.

R. Jung, E.J. Brauer, J.J. Abbas and S. Grandhe "Analog VLSI-Spinal Cord Interface for Motor Control", *Proc. IEEE/BMES Conf.*, (Atlanta, GA), pp. 488, 1999.

E.J. Brauer, J.J. Abbas, B. Callaway, J. Colvin and J. Farris, "Hardware Implementation of a Neural Network Pattern Shaper Algorithm", *Proc. IJCNN*, paper no. 590, 1999.

E.J. Brauer, R. Jung, B. Thompsen and J.J. Abbas "aVLSI circuit of lamprey unit pattern generator", *Proc. IJCNN*, paper no. 591, 1999.

J.A. Riess\* and J.J. Abbas, "Evaluation of Adaptive Neural Network Controller in Cyclic Movement Using Functional Neuromuscular Stimulation", *Proc. RESNA*, (Minneapolis, MN), pp. 220-223, 1998. (oral presentation by J.A. Riess\* with J.J. Abbas).

E. Stites\* , J.J. Abbas and R.J. Triolo "Adaptive Mapping for the Control of Standing with Functional Neuromuscular Stimulation", *2<sup>nd</sup> Conf. of Intl. FES Society*, (Vancouver, BC), pp. 83-84, 1997. (poster presentation by E. Stites\* with J.J. Abbas).

J.A. Riess\* and J.J. Abbas, "Evaluation of Adaptive and Feedback Controllers for use in Functional Neuromuscular Stimulation Systems", *Proc. 2<sup>nd</sup> Conf. of Intl. FES Society*, (Vancouver, BC), pp. 79-80, 1997. (poster presentation by J.A. Riess\* with J.J. Abbas).

E.J. Brauer, H.J. Lee and J.J. Abbas, "Development of Hardware for Implementing Adaptive Controllers in Functional Neuromuscular Stimulation Systems", *Proc. 2<sup>nd</sup> Conf. of Intl. FES Society*, (Vancouver, BC), pp.255-256, 1997. (poster presentation by J.J. Abbas)

J.J. Abbas, "Neural Networks for Control of Posture and Locomotion", *Proc. American Control Conf.*, (Albuquerque, NM), 1997 (*Invited Paper*). (oral presentation by J.J. Abbas).

E.J. Brauer, R. Jung, D. Wilson and J.J. Abbas, "Analog Circuit Model of Lamprey Unit Pattern Generator", *Proc. 7<sup>th</sup> Great Lakes Symposium on VLSI*, pp. 137-142, 1997.

E.J. Brauer, R. Jung, D. Wilson and J.J. Abbas, "Sensitivity Analysis of an Analog Circuit Model of Lamprey Unit Pattern Generator", *Proc. IJCNN*, pp. 975-979, 1997.

H. Dou, Z. Zhou, Y. Chen, J.X., Xu and J.J. Abbas, "Iterative Learning Control Strategy for Functional Neuromuscular Stimulation," *Proc. 18<sup>th</sup> IEEE/EMBS Conf.*, (Amsterdam), 1996.

S.P. Jayasundera\* and J.J. Abbas, "Strategies for Controlling Coupled Segments Using a Network of Pattern Generators," *Proc. 1<sup>st</sup> Conf. of Intl. FES Society*, (Cleveland, OH), 1996. (poster presentation by S.P. Jayasundera\* with J.J. Abbas).

S.P. Jayasundera\* and J.J. Abbas, "Adaptive Feedforward Control of Coupled Systems", *Proc. World Congress on Neural Networks*, (Washington, DC), Vol. 1; pp. 400-404, 1995. (oral presentation by S.P. Jayasundera\* with J.J. Abbas).

S.P. Jayasundera\* and J.J. Abbas, "Neural Network Control of Cyclic Movements Using Functional Electrical Stimulation", *IASTED Intl. Conf. on Modelling and Simulation* (Colombo, Sri Lanka), 1995. (oral presentation by S.P. Jayasundera\* with J.J. Abbas).

J.J. Abbas "Using Neural Models in the Design of a Movement Control System", *Proc. Computation and Neural Systems Conf.* (Monterey, CA), 1995. (poster presentation by J.J. Abbas).

J.J. Abbas and H.J. Chizeck, "Phase-dependent Reflexes in a Neural Network Control System", *Proc. 13<sup>th</sup> Southern Biomedical Eng. Conf.*, (Washington, DC), pp. 494-497, 1994 (oral presentation by J.J. Abbas).

J.J. Abbas and R.J. Triolo, "Experimental Evaluation of an Adaptive Feedforward Controller for Use in Functional Neuromuscular Stimulation Systems", *Proc. 15<sup>th</sup> IEEE/EMBS Conf.*, (San Diego, CA), pp. 1326-1327, 1993. (poster presentation by J.J. Abbas).

J.J. Abbas and H.J. Chizeck, "Neural Network Control of Two-segment Skeletal Movements", *Proc. World Congress on Neural Networks*, (Portland, OR), 1993.

J.J. Abbas and H.J. Chizeck, "Adaptive Feedforward Control of Cyclic Movements Using Artificial Neural Networks", *Proc. Int. Joint Conf. on Neural Networks*, (Baltimore, MD), 1992. (oral presentation by J.J. Abbas).

J.J. Abbas and H.J. Chizeck, "A Neural Network Controller for Functional Neuromuscular Stimulation Systems", *Proc. 13<sup>th</sup> IEEE/EMBS Conf.*, (Orlando, FL), pp. 1456-1457, 1991. (poster presentation by J.J. Abbas).

J.J. Abbas and H.J. Chizeck, "FNS Control System Tuning and Clinical Ratings of Performance", in *Proc. 11<sup>th</sup> IEEE/EMBS Conf.*, (Seattle, WA), pp. 1494-1495, 1989. (poster presentation by J.J. Abbas).

J.J. Abbas, H.J. Chizeck, G. Borges, P. Chow, P. Lambert and M. Moynahan, "A Software Structure for Implementing Multi-state Feedback Controllers in FNS Systems", in *Proc. 10<sup>th</sup> IEEE/EMBS Conf.*, (New Orleans, LA), pp. 1653-1654, 1988. (poster presentation by J.J. Abbas).

K. Barnicle, J.J. Abbas, Q.Y. Du, C.L. Miao, W. Ko, P. Muccio, E.B. Marsolais and H.J. Chizeck, "Using Stretch Sensors to Measure Knee and Hip Angles", in *Proc. RESNA 10<sup>th</sup> Annual Conf.*, (San Jose, CA), pp. 603-604, 1987.

J.J. Abbas and H.J. Chizeck, "Feedback Control of the Hip and Trunk in Paraplegic Subjects Using Functional Neuromuscular Stimulation", in *Proc. 9<sup>th</sup> IEEE/EMBS Conf.* (Boston, MA), pp. 1571-1572, 1987. (oral presentation by J.J. Abbas).



**ABSTRACTS (\* indicates students mentored)**

K. Narayanan, H. Shill, J. Stovall, O'Donnell, P. Mahant, J. Samanta, A. Lieberman, and J.J. Abbas, "Polestriding improves gait in Parkinson's disease", Society for Neuroscience 41<sup>st</sup> Annual Meeting, Washington, DC, 2011.

K. Narayanan, C. Williams, J. Stovall, A. Biemond, M. Raasch, and J.J. Abbas, "Electrical stimulation training improves orthostatic tolerance in spinal cord injury", Society for Neuroscience 41<sup>st</sup> Annual Meeting, Washington, DC, 2011.

B.K Hillen, J. Abbas, D. Jindrich, and R. Jung, "Computational model of the effects of muscle strength and activation on foot drag in the SCI rat ankle", Society for Neuroscience 38<sup>th</sup> Annual Meeting, Washington, DC, 2008.

N. Krishnamurthi, A. Sitek\*, P. Mahant, J. Samanta, and J. J. Abbas, "Effects of Deep Brain Stimulation Amplitude on Gait in Parkinson's Disease" Society for Neuroscience 37<sup>th</sup> Annual Meeting, San Diego, CA, 2007.

M. Bhowmik-Stoker\*, R. Herman, S, Allison, and J. J. Abbas, "Adaptive control of electrical stimulation to supplement locomotor retraining after spinal cord injury" Society for Neuroscience 37<sup>th</sup> Annual Meeting, San Diego, CA, 2007.

A.L. Downing\*, D.R. Fay, and J.J. Abbas, "Force Coordination Training in Children with Spastic Diplegia", Society for Neuroscience 37<sup>th</sup> Annual Meeting, San Diego, CA, 2007.

B.K. Hillen, J.J. Abbas, G. Yamaguchi and R. Jung, "Effects of spinal cord injury on musculoskeletal parameters in the rodent.", Society for Neuroscience 37<sup>th</sup> Annual Meeting, San Diego, CA, 2007.

S. Allison\*, M. Bhowmik\*, D. Channer, R. Herman, J. J. Abbas, "Selecting suitable movement patterns for locomotor retraining using partial weight bearing therapy" Society for Neuroscience 36<sup>th</sup> Annual Meeting, Atlanta, Georgia, 2006.

A. J. Sitek\*, J. J. Abbas, D. M. Lieberman, P. Mahant, J. Samanta, "Location and orientation of active contacts in deep brain stimulation systems", Society for Neuroscience 36<sup>th</sup> Annual Meeting, Atlanta, Georgia, 2006.

R. Jung, A. Belanger, T. Kanchiku, J. Lynskey, M. Mukherjee, D. Hagner, J.J. Abbas, "Hindlimb neuromuscular stimulation therapy after thoracic contusion injury promotes locomotor recovery", 11th Annual Conference of the International Functional Electrical Stimulation Society, Miyagi-Zhao, Japan, 2006.

T. Kanchiku, J.V. Lynskey, T. Tagachi, J.J. Abbas, R. Jung, "Rodent model for forelimb neuromuscular stimulation based movement therapy". 11th Annual Conference of the International Functional Electrical Stimulation Society, Miyagi-Zhao, Japan, 2006.

A. Sitek\*. D. Liberman, and J.J. Abbas, "DBS Electrode Location and Clinical Outcomes in Parkinson's Disease", American Society of Stereotactic and Functional Neurosurgery, 2006, Boston, MA.

K. Narayanan, S. Mulligan\*, P. Mahant, J. Samanta and J.J. Abbas, “*Deep Brain Stimulation Effects on Posture Control in Parkinson’s Disease*”, World Parkinson Congress, Feb., 2006, Washington D.C. Abstract published in *Movement Disorders*, Vol. 21/Supp. 13, 2006, Abstract No. P209, Page. S115.

S. Mulligan\*, K. Narayanan, P. Mahant, J. Samanta and J.J. Abbas, “*Effect of deep brain stimulation on posture control in Parkinson’s disease*”, 9<sup>th</sup> International Congress of Parkinson’s disease and Movement Disorders, March 5-8, 2005, New Orleans, Louisiana.

J.V. Lynskey, A. Belanger, T. Kanchiku, G.Venkatasubramanian, M.Mukherjee, A. Thota, J. Abbas, R. Jung. Therapeutic Neuromuscular Stimulation Therapy Improves Recovery of Locomotion after Incomplete Spinal Cord Injury in Adult Rats. (Poster presentation at the 11<sup>th</sup> International Symposium on Neural Regeneration, December 14-18, 2005, Asilomar, CA,

G. Venkatasubramanian, T. Kanchiku, M. Mukherjee, J.J. Abbas, R. Jung. Functional neuromuscular stimulation after spinal cord injury: a rodent model. 23<sup>rd</sup> Annual National Neurotrauma Society Meeting, Washington DC, Nov 10-11, 2005.

M. Mukherjee A. Belanger, T. Kanchiku, J. Lynskey, A. Thota, J.J. Abbas, R. Jung. Functional neuromuscular stimulation after incomplete spinal cord injury in rodents promotes recovery of locomotion. 23<sup>rd</sup> Annual National Neurotrauma Society Meeting, Washington DC, Nov 10-11, 2005.

K. Kanchiku, A. Belanger, G. Venkatasubramanian, M. Mukherjee, J.V. Lynskey, A. Thota, J. Abbas, R. Jung. Functional Neuromuscular Stimulation Therapy Promotes Recovery of Locomotion after Incomplete Spinal Cord Injury in Adult Rats. *Cervical Spine Research Society 33rd Annual Meeting*, Dec 1-Dec 3, 2005, San Diego, California.

A. Belanger, T. Kanchiku, M. Mukherjee, J. Lynskey, J.J. Abbas, R. Jung. A Rodent Model of Functional Neuromuscular Stimulation Therapy after Incomplete Spinal Cord Injury; Society for Neuroscience Annual Meeting, Washington DC. Nov12-16, 2005.

G. Venkatasubramanian, T. Kanchiku, M. Mukherjee, J.J. Abbas, R. Jung. Functional Neuromuscular Stimulation (FNS) Assisted Locomotion in a Paraplegic Rodent. Society for Neuroscience Annual Meeting, Washington DC. Nov12-16, 2005.

G. Venkatasubramanian, K. Ichihara, J.J. Abbas, R. Jung. Functional Neuromuscular Stimulation in a Paraplegic Rodent Model: Electrode Design, Implantation and Assessment *J. Neurotrauma* 21(9):P225, pg. 1320 2004. (Poster Presentation at the 22<sup>nd</sup> National Neurotrauma Society, Oct 21-Oct 22, San Diego, CA, MS, 2004 by R. Jung and G. Venakatasubramanian)

K. Ichihara, G. Venkatasubramanian, J.J. Abbas, R. Jung. Electrical stimulation paradigms to assist in locomotor training after spinal cord injury. *J. Neurotrauma*, 20(10):P412 pg.1131, 2003. (Presentation at the *National Neurotrauma Society*, Nov. 6-Nov. 7, Biloxi, MS, 2003)

V.Krishnamohan, J.J.Abbas, G.T.Yamaguchi, R.Jung, “Biomechanical Model of an Unloaded Rat Hindlimb”, *Soc. Neurosci. Abs.*, 2003.

J.C. Gillette, N.E. Quick, J.J. Abbas, “Hand Support Forces When Using Functional Neuromuscular Stimulation to Assist in Standing”, *Proc. ACSM*, 2003.

- N. Ravi, V. Booth, J.J. Abbas and R. Jung, "A two-compartment vertebrate motoneuron model to investigate effects of afferent nerve stimulation", *Soc. Neurosci. Abs.*, 2002.
- A. Thota, R. Jung and J.J. Abbas, "Adaptive control of endpoint position by weighted activation of force fields", *Annals BME Suppl.*, 2001.
- S, Grandhe, J.J. Abbas and R. Jung. Periodic perturbation effects on locomotor rhythm and motor pattern generation in the lamprey. *Soc. for Neuroscience Abstracts*, 26(2):834.1, 2000.
- R. Jung, E.J. Brauer and J.J. Abbas, "A Real-time Neuromorphic Analog VLSI-Spinal Cord Interface for Rhythmic Motor Control", *Soc. for Neuroscience Abstracts*, Vol. 25, 422.3, p. 1038, 1999.
- J.A. Riess\*, Neiser, J.D.\*, E. Hartman\* and J.J. Abbas "Evaluation of Input Devices for Use in Functional Neuromuscular Stimulation", *Annals BME Suppl.*, pp. S-132, 1998.
- X. Zhang\*, J.J. Abbas and R.J. Triolo, "The Effects of Co-stimulation Map Parameters on FNS System Performance", *Annals BME Suppl.*, pp. S-133, 1998.
- P. Kataria\* and J.J. Abbas, "Estimating Body Segment Orientation Using a Lightweight, Inexpensive Gyroscope", *Annals BME Suppl.*, pp. S-133, 1998..
- E. Hartman\* and J.J. Abbas, "Time Delays and Model Reference Adaptive Control in Function Neuromuscular Stimulation", *Annals BME Suppl.*, pp. S-133, 1998.
- R. Jung, J.J. Abbas and E.J. Brauer, "Entrainment Of An Analog VLSI Model of Lamprey Unit Pattern Generator", *Annals BME Suppl.*, pp. S- 99, 1998.
- L. Knapp, J. Atchison, R. Shapiro, R. Salcido and J.J. Abbas, "Electromyographic and Kinematic Analysis of the Painful Hemiplegic shoulder Before and After Subscapularis Motor Point Block", *Proc. AAPM&R*, (Chicago), 1996.
- E. Stites\* and J.J. Abbas, "Parameter Selection in an Adaptive Control System for Biomedical Applications", *KY Acad. Sciences*, (Frankfort, KY), 1996.
- L. Knapp, J. Atchison, R. Shapiro, R. Salcido and J.J. Abbas, "Electromyographic and Kinematic Analysis of the Painful Hemiplegic shoulder Before and After Subscapularis Motor Point Block", *Gait and Posture*, Vol. 4, p. 182, 1996.
- J.J. Abbas and S.P. Jayasundera\* "Adaptive Control of Movement Using Models of Neural Circuitry", *Soc. for Neuroscience Abstracts*, p. 147, (San Diego, CA), 1995.
- S.P. Jayasundera\* and J.J. Abbas, "Adaptive Neural Network Control of a Stepping Movement in a Three Segment Model", *Proc. BMES Society Conf.*, (Phoenix, AZ), 1994.
- J.J. Abbas and H.J. Chizeck, "Processing Skin Stretch Sensor Measurements of Hip and Trunk Angles", in *Proc. 40<sup>th</sup> ACEMB Conf.* (Niagara Falls, NY), pp. 222, 1987.

## INVITED PRESENTATIONS AT NATIONAL/INTERNATIONAL MEETINGS

"Smart Hybrid Biosystems in Prosthetics and Rehabilitation", IEEE BioCAS 2010, (Paphos, Cyprus), November, 2010.

"Neural Oscillators and Cyclic Movements", Organization for Computational Neurosciences, CNS\*2010, (San Antonio, TX), July, 2010.

"Adaptation in the FES Device and in the Nervous System", Contemporary Forums on Spinal Cord Injuries, (Boston, MA), May, 2010.

"Neuromorphogenic Adaptation", presented at Institute for Neuromorphic Engineering 15<sup>th</sup> Annual Workshop (Telluride, CO), July 2008.

"Adaptive Neural Systems", presented at the 3<sup>rd</sup> International Conference on Body Area Networks, (Tempe, AZ), March, 2008.

"Personalized neuromuscular electrical stimulation for exercise or neuromotor therapy", J. Abbas, 30th Annual Meeting of the Mid-Atlantic Regional Chapter of the American College of Sports Medicine (Harrisburg, PA), Nov. 2, 2007.

"Neuromorphic Design of Smart Prosthetic and Therapeutic Systems", presented at Institute for Neuromorphic Engineering 14<sup>th</sup> Annual Workshop (Telluride, CO), July 2007.

"Smart Prosthetics" presentation the Board of the National Academies and to the Beckman Center Advisory Board, (Irvine, CA), Feb. 2007.

"Control of movement using electrical stimulation of paralyzed muscles: a medical problem suited for a neuromorphic solution?" presented at the Institute for Neuromorphic Engineering Workshop, (Zurich, Switzerland), 2005.

"Functional Neuromuscular Stimulation", presented at *1st Annual Neurorehabilitation Symposium, "Clinical Advanced in Neurorehabilitation Science"*, (Lexington, KY), Sept. 2001. (organized workshop and gave oral presentation for clinicians on current practice and new research in the use of electrical stimulation systems)

"Using Mathematical Models and Advanced Control Systems Techniques to Enhance Neuroprosthesis Function", presented with R. Riener at *6<sup>th</sup> Annual Conference of the International Functional Electrical Stimulation Society*, (Cleveland, OH), June 2001.

"Adaptive Algorithms to Custom-fit the Neuroprosthesis to the User", presented at the *NIPS\*2000 Workshop*, (Breckenridge, CO), Dec. 2000.

"Neural Networks for Control of Posture and Locomotion", presented at the *American Control Conference*, (Albuquerque, NM), June, 1997.

"Justifying Technology in the Managed Care Environment", presented at *9<sup>th</sup> Annual Interdisciplinary Rehabilitation Conference*, (Lexington, KY), August, 1996.

"Application of Neural Pattern Generators for the Restoration of Motor Function using Functional Neuromuscular Stimulation", presented at *Biomechanics & Neural Control of Movement Conference* (Mt. Sterling, OH), June 1996.

“Functional Electrical Stimulation Ambulation Techniques”, presented at *Spinal Cord Injury: Issues and Advances*, (Washington, DC), Nov. 1994.

“The Use of Neural Network Algorithms in Functional Neuromuscular Stimulation Control Systems”, presented at *Neural Prostheses: Motor Systems IV Conference* (Mt. Sterling, OH), July 1994.

### INVITED SEMINARS

“Adaptive Technology, Neural Adaptation and Rehabilitation”, Institute of Biomaterials and Biomedical Engineering, University of Toronto, Apr. 2011.

“Adaptive Technology to Promote Neural Adaptation”, The Miami Project, Mar. 2011.

“Neural Systems, Rehabilitation Engineering, and Adaptive Processes”, Paradise Valley Hospital, AZ, May 2010.

“Promoting Neural Adaptation Using Adaptive Technology”, Dept. of Kinesiology, University of Maryland, Oct. 2009.

“Adaptive Biomimetic Technology to Promote Neural Adaptation”, Biomedical Distinguished Lecture Series, National Centre for Biomedical Engineering Science, National University of Ireland, Galway, July, 2009.

“Neuromorphic Design of Adaptive Systems for Neuromotor Rehabilitation”, Department of Mechanical Engineering, University of Florida, Gainesville, Feb. 2009.

“Personalized Technology for Neuromotor Therapy”, Department of Physical Therapy, University of Florida, Gainesville, Feb. 2009.

“Adaptive Biomimetic Technology to Promote Neural Adaptation”, Joint Basic Medical Sciences and Biomedical Informatics Departmental Seminar Series, Arizona State University, Oct. 2008.

“Promoting Neural Adaptation using Adaptive Technology”, Department of Electrical Engineering, Northern Arizona University, Oct. 2008.

"Advances in neuromotor therapy after spinal cord injury", J. Abbas, 8th Educational Conference of the Arizona Spinal Cord Injury Association (Phoenix, AZ), Oct. 2007.

"Delivering Neurotechnology", presented at 'Commercializing Arizona Forum' (Phoenix, AZ), Oct. 2007.

“Improving neuromotor function after incomplete spinal cord injury”, Neurorehabilitation Unit, Barrow Neurological Institute, (Phoenix, AZ), Sept.. 2007.

"Parkinson's Disease: Treatment Using Deep Brain Stimulation" Arizona Grand Democrats, (Sun City, AZ), March 2007.

"Traumatic Spinal Cord Injury: Adaptation and Recovery" President's Community Enrichment Program, Arizona State University, (Tempe, AZ), March 2007.

"Adaptive Neural Systems", Arizona State University Foundation, (Tempe, AZ), Oct. 2006.

"Designing Adaptive Systems to Promote Adaptation in Neural Systems", The Biodesign Institute at Arizona State University, (Tempe, AZ), June 2006.

"Technology to Promote Adaptation in Neural Systems", Discovery Tour, The Ira A. Fulton School of Engineering, Arizona State University, (Tempe, AZ), April 2006.

"Neuroengineering and Neurorehabilitation", The Biodesign Institute, Arizona State University, (Tempe, AZ), Feb. 2006.

"Unlocking the Mysteries of the Brain" ASU Adventures in Learning Program (ASU, Tempe), November 2005. (presented with Thomas Hamm from Barrow Neurological Institute)

"Spinal Cord Injury Research", presented at the Annual Meeting of the Arizona Spinal Injury Association, (Phoenix, AZ), Oct. 2005.

"Improving Deep Brain Stimulation System Parameter Selection", Wintech, Department of Electrical Engineering, Arizona State University, (Tempe, AZ), Nov. 2005.

"Deep Brain Stimulation after Parkinson's Disease: Developing Strategies for Improved Clinical Outcomes", presented with N. Krishnamurthi and A. Sitek at the Biodesign Institute, Arizona State University, (Tempe, AZ), Sept. 2005.

"Neuroprostheses and neuromotor therapy after spinal cord injury", Neurorehabilitation Unit, Barrow Neurological Institute, (Phoenix, AZ), Feb. 2005.

"Neuromuscular electrical stimulation for exercise and neuromotor therapy after spinal cord injury", The NeuroInstitute, (Tempe, AZ), Feb. 2005.

"New Strategies for Using Electrical Stimulation in Neurorehabilitation", Barrow Neurological Institute, (Phoenix, AZ), Jan. 2004.

"Standing after spinal cord injury: strategies for improving functional performance", Biomedical Engineering Program, University of Arizona, (Tucson, AZ) April 2003.

"Posture Control in Parkinson's Disease", Department of Kinesiology, Arizona State University, (Tempe, AZ), Dec. 2003.

"Adaptive Control of Systems for Neurorehabilitation", Department of Mathematics and Statistics, Arizona State University, (Tempe, AZ) Nov. 2003.

"Standing after spinal cord injury: strategies for improving functional performance", NSF IGERT Program on Neural & Musculoskeletal Adaptation in Form & Function, Arizona State University, (Tempe, AZ) Feb. 2003.

"Standing after spinal cord injury: strategies for improving functional performance", Scottsdale Community College, (Tempe, AZ) Feb. 2003.

"Engineering a new era in medical rehabilitation", Biomedical Engineering Department Seminar, Arizona State University, (Tempe, AZ) Sept. 2002.

"Advanced in Neurorehabilitation: Functional Electrical Stimulation for Standing, Exercise and Therapy after Spinal Cord Injury" presented at the annual research symposium at the Rehabilitation Hospital of Indiana (Indianapolis, IN), June 2002.

"Neural Stimulation for Motor Control" presented to the Lexington Chapter of the IEEE (Lexington, KY), May 2001.

"Bioengineering the Nervous System: approaches to investigate, replace and repair the injured spinal cord" presented to the KY-IN Chapter of the Paralyzed Veterans of America (Louisville, KY), Sept. 2000.

"Fitting the Neural Prosthesis to the User", Department of Electrical Engineering, University of Twente, (Enschede, The Netherlands), July, 2000.

"Fitting the Neural Prosthesis to the User", Center for Biomedical Engineering, University of Kentucky (Lexington, KY), April 1999.

"Customizing the FNS Control System for the User", Neural Prosthesis Seminar, FES Center, Case Western Reserve University, (Cleveland, OH), March 1999.

"Using Mathematics in the Rehabilitation of People with Spinal Cord Injury", presented to 1996 NSF Mathematics Research Experience for Undergraduates (REU) Program at The University of Kentucky, (Lexington, KY), July 1996.

"Laboratory Methods for Implementing and Evaluating Neural Control Systems", presented to 1996 NSF Mathematics Research Experience for Undergraduates (REU) Program at The University of Kentucky, (Lexington, KY), July 1996.

"Closed-Loop Control of FNS Walking", presented at FES Center, (Cleveland, OH), March 1995.

"Modulated Reflexes and Multi-joint Control of FNS Systems", presented at the Rehabilitation Engineering Center, MetroGeneral Health Center, (Cleveland, OH), March 1995.

"Neural Network Control of Functional Neuromuscular Stimulation Systems", presented at Center for Biomedical Engineering, University of Kentucky, (Lexington, KY), Jan. 1995.

"Using Neural Models in the Design of a Biomedical Engineering Control System", presented at The Mathematical Research Branch, NIH, (Bethesda, MD), Aug. 1994.

"Neural Network Control of Cyclic Movements Using Functional Neuromuscular Stimulation", presented at Dept. of Physiology, Howard Univ. Medical School, (Washington, DC), Feb. 1994.

"Control of Functional Neuromuscular Stimulation Systems", presented at Shriver Laboratory, University of Maryland at College Park, (College Park, MD), Oct. 1993.

"Neural Network Control of Cyclic Movements Using Functional Neuromuscular Stimulation", presented at Dept. of Mechanical Engineering, The Catholic University of America, (Washington, DC), March 1993.

"Neural Network Control of Cyclic Movements Using Functional Neuromuscular Stimulation", presented at Dept. of Bioengineering, Univ. of Pennsylvania, (Philadelphia, PA), October 1992.

"Neural Network Control of Functional Neuromuscular Stimulation Systems", presented at Dept. of Biomedical Engineering, Case Western Reserve Univ.,(Cleveland, OH), May 1992.

“Neural Network Control of Cyclic Movements Using Functional Neuromuscular Stimulation”, presented at Dept. of Bio, Chemical and Materials Engineering, Arizona State University, (Tempe, AZ), April 1992.

“Feedback Control of Coronal Plane Hip and Trunk Angles Using Functional Neuromuscular Stimulation”, presented at Dept. of Biomedical Engineering, Case Western Reserve University, (Cleveland, OH), Sept. 1989.

### NATIONAL/INTERNATIONAL HONORS AND OFFICES

|                       |   |
|-----------------------|---|
| April '10 – April '13 | Associate Editor,<br>IEEE EMBS Conference Editorial Board (CEB)   |
| June '09 - present    | Review Editor,<br>Frontiers in Neuroengineering   |
| June '03 - present    | Editorial Board,<br>Journal of Neuroengineering and Rehabilitation  |
| Jan '02 – present     | Member, Rehabilitation Engineering Advisory Panel,<br>Rehabilitation Engineering Research Center on Recreational<br>Technologies, University of Illinois, Chicago.  |
| Sept. '08             | Organizing Committee and Technical Program Committee,<br>Annual Conference of the International Functional Electrical<br>Stimulation Society (IFESS), Freiburg, Germany   |
| Sept. '07             | Session Co-Chair,<br>Neural Stimulation and Rehabilitation Session,<br>BMES Annual Meeting, Los Angeles, California.  |
| Nov '06               | Selected Participant; 4 <sup>th</sup> Annual National Academies Keck <i>Futures<br/>Initiative</i> Conference on “Smart Prosthetics: Exploring Assistive<br>Devices for the Body and Mind”; Nov 9-12, Irvine, CA. |
| Sept. '03             | Session Co-Chair,<br>Functional Electrical Stimulation Session,<br>IEEE/EMBS Conference, Cancun, Mexico.  |
| Jan '03 – June 03     | Member, Scientific Program Committee,<br>Annual Conference of the Internal Functional Electrical Stimulation<br>Society (IFESS), Queensland, Australia.   |
| Oct. '02              | Session Co-Chair,<br>Functional Electrical Stimulation Session,<br>Joint EMBS/BMES Conference, Houston, TX.   |
| Jan. '02 – Dec. 04    | Treasurer, Intl. Functional Electrical Stimulation Society (IFESS)  |
| June '01              | Session Co-Chair,<br>Biomechanics, Modeling and Control Session,  |



- Annual Conf. of Intl. Functional Electrical Stimulation Society (IFESS), Cleveland, OH.
- July '00 – June 01 Member, Scientific Program Committee,  
Annual Conference of the Internal Functional Electrical Stimulation Society (IFESS), Cleveland, OH.
- Sept. '00 - Sept. '03 Chair,  
Special Interest Group on Functional Neuromuscular Stimulation, RESNA.
- June '00 Invited Participant,  
NIH-NINDS sponsored Workshop: "Functional and Dysfunctional Spinal Circuitry: Role for Rehabilitation and Neural Prostheses"  
UCLA, Los Angeles, CA
- April '00 Session Chair, Computational Models of Neural Control of Movement: Failure and Recovery Session.  
Neural Control of Movement Conference, Key West, FL
- Sept. '99 - Sept. '00 Chair-elect,  
Special Interest Group on Functional Neuromuscular Stimulation, RESNA.
- Sept. '99 Assistant Editor,  
*Assistive Technology*,  
Special Issue on Functional Electrical Stimulation.
- October '98 Session Co-Chair,  
Musculoskeletal Modeling Session, BMES Conference, Cleveland, OH.
- October '98 Session Co-Chair,  
Measurement Devices and Control Session, BMES Conf., Cleveland, OH.
- June - Dec. '96 Section Co-Editor,  
"Section IV: Neuromechanical Interaction in Rhythmic Systems" in Biomechanics and Neural Control of Movement,  
Ed. by J.M. Winters & P.E. Crago, Springer-Verlag, 2000.
- October '94 Session Co-Chair,  
Young Investigator Symposium, Neural Prosthesis Workshop,  
National Institutes of Health, Bethesda, MD.
- April '94 Session Co-Chair,  
Neuromotor Control Systems Session,  
13<sup>th</sup> Southern Biomedical Engineering Conference, Washington, DC.

## INVITED REVIEWER

### *Funding Agencies:*

#### National Institutes of Health:

EUREKA Study Section (2011)  
National Center for Medical Rehabilitation Research, ad hoc reviews (2010, 2011)  
Function, Integration and Rehabilitation Subcommittee, National Center for Medical Rehabilitation Research, Standing Member (2006-2010)  
National Institute of Neurological Disorders & Stroke, Special Emphasis Panel (2007)  
National Institute of Neurological Disorders and Stroke Initial Review Group (2006)  
Clinical Neuroscience and Disease Study Section (2006 a,b)  
National Center for Medical Rehabilitation Research, Special Study Section (2005-6)  
Brain Disorders and Clinical Neurosciences-1, Ad-hoc member (2007; 2006; 2005a,b,c; 2004a,b,c; 2001)  
Medical Rehabilitation Research Subcommittee Study Section (2002)  
Human Brain Project Special Emphasis Study Section (2002)  
Geriatrics and Rehabilitation Medicine Study Section (2001, 2002)  
Multidisciplinary Clinical Sciences Special Emphasis Study Section (9 panel meetings, 1995-1999).

#### Department of Education:

National Institute for Disability and Rehabilitation Research Rehabilitation Engineering Research Center Panel, (2004)  
National Institute for Disability and Rehabilitation Research Field Initiated Research Review Panel Standing Member, (1999- 2003)  
National Institute for Disability and Rehabilitation Research Small Business Innovation Research Review Panel, (2000- 2001)

#### National Science Foundation:

Biomedical Engineering Career Awards Review Panel (2001)  
Integrative Biology and Neuroscience, Ad-hoc Review (2001)  
Biomedical Engineering Research to Aid Persons with Disabilities Panel (2001)  
Biomedical Engineering Research to Aid Persons with Disabilities Panel (2000)  
Instrument Development for Biological Research, Ad-hoc Review (2000)  
Computational Neuroscience, Ad-hoc Reviewer (1996)  
Behavioral Neuroscience. Ad-hoc Reviewer (1996)  
Biological Systems Analysis & Control Panel (1995)  
Biomechanics & Rehabilitation Panel (1994)

#### Department of Defense, Spinal Cord Injuries Research Panel, Chair (2010, 2011,2012)

Neurological Foundation of New Zealand (2009)  
Canada Foundation for Innovation (2009)  
Netherlands Technology Foundation (2009)  
US Army MPMC (2008)  
University of Wisconsin: Internal Funding (2008)  
Barrow Neurological Institute (2007a,b).  
Department of Veterans Affairs, Rehabilitation Research & Development (2010, 2003)  
University of Southern California: Internal Funding.

The National Academies (2003).

|                     |  |
|---------------------|--|
| <i>Journals:</i>    | Journal of Neuroengineering and Rehabilitation<br>IEEE Transactions on Biomedical Engineering<br>IEEE Transactions on Rehabilitation Engineering<br>Annals of Biomedical Engineering<br>Assistive Technology<br>Intelligent Systems Engineering<br>Biomedical Instrumentation and Technology<br>Advances in Skin and Wound Care<br>Physics in Medicine & Biology<br>Journal of Rehabilitation Research and Development<br>Experimental Neurology |
| <i>Conferences:</i> | Internal Functional Electrical Stimulation Society Annual Conference<br>IEEE Engineering in Medicine & Biology Conference<br>Rehabilitation Engineering Society of North America Conference  |

### **MEDIA EXPOSURE (SELECTED)**

Irish Times, August 2009, “New Hope for Victims of Spinal cord Injury”,  
<http://www.irishtimes.com/newspaper/health/2009/0804/1224251958684.html>

ASU research magazine (Stories of Scholarship and Creative activity), March 2009, “Stimulated to Heal”, [http://researchmag.asu.edu/2009/03/Stimulated\\_to\\_heal.html](http://researchmag.asu.edu/2009/03/Stimulated_to_heal.html)

Neurotech business report, vol. 8, No. 3., March 2008. “Adaptive Control Methods Transform Neuroprosthetics”, <http://www.neurotechreports.com/>

Full Circle Magazine, Ira A Fulton School of Engineering, ASU; Fall 2007; “To Walk Again”  
[http://www.fulton.asu.edu/fulton/news/publications/Fall2007\\_Full%20Circle.pdf](http://www.fulton.asu.edu/fulton/news/publications/Fall2007_Full%20Circle.pdf)

Arizona Republic. Feb 9, 2006; “Pair Look to Reboot the Brain”,  
<http://www.azcentral.com/arizonarepublic/business/articles/0209innovator09.html>

Flinn Foundation, Jan 23, 2006; “Two family teams, one academic and one private, net state millions in NIH grants”, <http://www.flinn.org/news/408>

### **UNIVERSITY SERVICE**

#### Arizona State University

|       |   |
|-------|---|
| 2012- | Faculty Advisor, Student Chapter of Engineering World Health, Ira A. Fulton Schools of Engineering. |
| 2011- | Member, Dean’s Executive Committee, Ira A. Fulton Schools of Engineering.                           |
| 2011- | Member, Personnel Committee, School of Biological and Health Systems Engineering.                   |
| 2010- | Senator, Faculty Senate Representative of the School of Biological and Health Systems Engineering.  |

|             |  |
|-------------|--|
| 2010-       | External Member, Promotion and Tenure Committee (Department of Biomedical Informatics).              |
| 2009-       | Member, Grand Challenge Scholars Faculty Oversight Committee (Ira A. Fulton Schools of Engineering). |
| 2009 - 2011 | Member, Health Care Search Committee, (Ira A. Fulton Schools of Engineering)                         |
| 2006-2007   | Member, Biosensors Search Committee (Electrical Engineering).  |
| 2005-2006   | Member, Bioengineering Dept Chair Search Committee.  |
| 2003-2004   | Chair, Neuroprosthesis Search Committee (Bioengineering).  |
| 2003-2004   | Member, BioMEMS Search Committee (Bioengineering).   |
| 2003-2004   | Member, Motor Control Search Committee (Bioengineering).   |
| 2003-2004   | Member, Biomechanics Search Committee (Bioengineering).  |
| 2003-2007   | Member, Personnel Committee (Bioengineering).  |
| 2005-2006   | Member, Safety Committee (Bioengineering).   |

University of Arizona College of Medicine - Phoenix

|           |  |
|-----------|--|
| 2008-2010 | Research Planning Committee, Neurosciences |
|-----------|--|

Banner Good Samaritan Medical Center

|           |   |
|-----------|---|
| 2007-2009 | Chair, Data Safety and Monitoring Board, Memantine Effects on ALS |
|-----------|---|

University of Kentucky: Center for Biomedical Engineering

|           |   |
|-----------|---|
| 2001      | Chair, Faculty Search Committee.  |
| 2001      | Directed the upgrade of bioinstrumentation teaching lab facilities.   |
| 1997–2002 | Member, Research Program Development Committee.<br>Participated in the planning and preparation of multi-investigator research initiatives from CBME.   |
| 1997–2002 | Member, Educational Program Development Committee.<br>Participated in the planning of new educational initiatives to be offered as part of our program. |
| 1995–1999 | Coordinator, Website Development Committee.<br>Initiated, developed and maintained the CBME website.  |

University of Kentucky: Department of Physical Medicine & Rehabilitation

|           |   |
|-----------|---|
| 2001-2002 | Chair, Research Committee.  |
| 2001-2002 | Chair, Multi-disciplinary Spinal Cord Injury Research Committee.                              |
| 2001-2002 | Member, Search Committee for Endowed Chair, Department of Physical Medicine & Rehabilitation. |
| 2000      | Research Day Planning and Organization.   |
| 1997–2001 | Member, Multi-disciplinary Spinal Cord Injury Research Committee.                             |
| 1996-2001 | Member, Research Committee.   |

- 1999 Research Day Planning and Organization.
- 1998 Research Day Planning and Organization.

University of Kentucky: Spinal Cord and Brain Injury Research Center

- 2000–2002 Member, Internal Advisory Board
- 2000–2001 Member, Conference Organizing Committee, *Clinical Advances in Neurorehabilitation Science*
- 2000 Member, Planning Committee, *KY Spinal Cord and Head Injury Research Conference*

University of Kentucky: Department of Kinesiology and Health Promotion

- 2000-2002 Member, Doctoral Program Advisory Board.

University of Kentucky: Department of Special Education and Rehabilitation Counseling

- 1995-2002 Member, Consumer Advisory Board, Technology Subcommittee.

University of Kentucky: Multi-disciplinary

- 1997 Faculty Mentor,  
NSF Mathematics Research Experience for Undergraduates (REU) Program at The University of Kentucky (2 students).
- 1996 Faculty Mentor,  
NSF Mathematics Research Experience for Undergraduates (REU) Program at The University of Kentucky.
- 1994 Instructor, "Engineering 2000" summer program for high school seniors, School of Engineering, The Catholic University of America.

University of Kentucky: Graduate School

- 2000 –2002 Member, Biomedical Sciences Panel of the Graduate Council Committee on Fellowships and Traineeships

**COURSES TAUGHT**

The Catholic University of America: 1993-1995

- Neural Stimulation in Rehabilitation (BE 531)
- Biological Systems & Control (BE 516)
- Human Locomotion (BE 522)
- Engineering Mechanics I (ENGR 201)
- Modeling Neural Systems (BE 532)
- Neural Control Systems (BE 732)
- Nonlinear Dynamics of Physiological Systems (BE 733)

The University of Kentucky: 1995- 2002

- Biomedical Control Systems I (BME 610)
- Biomedical Applications of Neural Networks (BME 699-002)

Advanced Biomedical Control Systems (BME 699-004)  
Neural Networks for Biomedical Control (BME 781-004)  
Measurement and Characterization of Muscle Function (BME 481-G)  
Independent Work in Biology (BIO 395)  
Engineering Techniques for Assessment and Treatment of Adult Neurological Disorders  
(BME 781-006; team taught)  
Biomedical Instrumentation (BME 530; team taught)  
Foundations of Biomedical Engineering (BME 501; team taught)  
Neural Engineering (EE 599; invited lectures)  
Muscle Physiology (KHP 781; invited lectures)

Arizona State University: 2002-present

Neural Prostheses (BME 598)  
Modeling and Simulation of Physiological Systems (BME 598)  
Introduction to Neural Engineering (BME 598)  
Biomechanics (BME 416)  
Engineering Perspectives on Biological Systems (BME 111)  
Technology for Global Health (BME 494/BME 598)  
The ASU Experience (ASU 101)  
Design of Experiments/Clinical Trials (BME 394)

Lectures in:

Introduction to Bioengineering (BME 100, 101)  
Engineering Perspectives on Biological Systems (BME 111)  
Bioengineering Product Design (BME 300)  
Microcomputer Applications in Bioengineering (BME 370)  
Motor and Developmental Learning (KIN 345)  
Biocontrol Systems (BME 419)  
Scientific Communications (BME 598)  
Computational Neuroscience (BME 598)  
Systems Neurophysiology (BME 598)  
Human Systems Neuroscience (BME 598)  
Advanced Physiology (BME 598)  
Anatomy & Biomechanics (BME 598)  
CNS Injury and Repair (Neurological Sciences Block in Med. School, U. of Arizona  
Medical School in partnership with Arizona State University)  
Neuromotor Assessment (Doctorate of Physical Therapy program at Franklin Pierce  
University)

## **STUDENTS MENTORED**

*Primary advisor for:*

### **GRADUATE STUDENTS**

Harrington Department of Bioengineering, Arizona State University:

Stefani Mulligan, M.S., 2005,

Thesis title: *Effect of Deep Brain Stimulation on Postural Control in Parkinson's Disease*

Brian Glaister, M.S., 2005

Thesis title: *Analysis of Prosthetic Feet in Above Knee Amputees*

Andrew Hayes, M.S., 2005

Thesis title: *Effect of Wheelchair Seatback on Propulsion in Experienced Manual Wheelchair Users*

Shelly Allison, M.S., 2006

Thesis title: *Adaptive Control of Locomotion During Partial Weight Bearing Therapy*

Almir Halilcevic, M.S., 2006

Project title: *Evaluation of PDA Platform for Development of Closed-Loop Functional Neuromuscular Stimulation Systems*

Anjali Gupta, M.S., 2006 (co-advised with Kristi Csavina, PhD)

Thesis title: *The Effect of Screw Diameter on the Fixation of a Lateral Plateau Split Fracture*

Elliot Downing, M.S., 2006 (co-advised with Neil Crawford, PhD)

Thesis title: *Subject-Specific Finite Element Modeling of the Lower Cervical Spine*

John McCamley, M.S., 2007 (co-advised with Kristi Csavina, PhD)

Thesis title: *Kinematics and Kinetics of Stair Climbing in Elderly Subjects: The Effects of Minimally Invasive Total Knee Arthroplasty*

Kimberly Yarnall, M.S. 2007 (co-advised with Kristi Csavina, PhD)

Thesis title: *Functional changes in gait during level walking and stair climbing after intertrochanteric hip fractures*

Alex Pacanowsky, M.S., 2008

Thesis title: *Exercise Response to Voluntary Arm Crank Ergometry and Electrically Stimulated Leg Cycling in a Subject with Complete Tetraplegia*

Andrea Downing, PhD, 2008

Thesis title: *Force Production and Control in Children with Cerebral Palsy*

Alison Sitek, PhD, expected 2012

Charla Lindley, PhD, expected 2013

Catherine Vuong, PhD, expected 2013

Postbaccalaureate Research Education Program, Arizona State University

Danielle Sampson, 9/09 – 8/10.

Center for Biomedical Engineering, University of Kentucky:

JoAnne A. Riess, M.S., 1997

Thesis title: *Evaluation of Adaptive Neural Network and Feedback Controllers in Cyclic Movement using Functional Neuromuscular Stimulation*

Pankaj Kataria, M.S., 1999

Thesis title: *User Controlled Functional Neuromuscular Stimulation System with an Adaptive Neural Network*

Eric Hartman, M.S., 2000

Thesis title: *Evaluation of a Neural Network Controller for an Antagonist Muscle System: An Approach for Control of Coronal Plane Standing Using FNS*

Xia Zhang, M.S., 2000

Thesis title: *The Effects of Hip Muscle Properties and Co-stimulation on the Control of Standing Using Functional Neuromuscular Stimulation*

Junli Ou, M.S., 2001

Thesis title: *Adaptive Control of Multi-segment Movements Using Functional Electrical Stimulation.*

Joseph Finley, M.S., 2002

Thesis title: *Feedback Signals to Adjust and Control Standing Posture*

**POST-DOCTORAL FELLOWS**

Jason C. Gillette, Ph.D. 1999-2002.

Alfred Haas, Ph.D., 2009-2011.

**UNDERGRADUATE STUDENTS**

Barrett, The Honors College, Arizona State University:

Crystal Ong, Honors Thesis Mentor, 2003.

Anjali Gupta, Honors Thesis Mentor, 2004

Jeremy Jellish, Honors Thesis Mentor, 2010-11

John Spanias, Honors Thesis Mentor, 2010-11

Shravan Sridhar, Honors Thesis Mentor, 2010-11

Stuart Wentz, Honors Thesis Co-Mentor, 2010-11

Jane Lucson, Honors Thesis Mentor, 2011-12

Harrington Department of Bioengineering, Arizona State University:

Luis Landgrave, Fulton Undergraduate Research Initiative, 2005

Modesto Lopez, Minority Access to Research Careers Fellow, 2007-08

Harrington Department of Bioengineering, Capstone Design Project Mentor:

|            |                 |                   |
|------------|-----------------|-------------------|
| 2003-2004: | Anjali Gupta    | Karen Lewis       |
|            | Darius Sanders  | Kellen Van Ausdal |
| 2004-2005: | David Breedlove | Tyson Padgett     |
|            | Edhem Sadikovic | Kimberly Yarnall  |
| 2005-2006: | Mark Schmitz    | Leela Doppalapudi |
|            | Darjan Emkic    | Luis Landgrave    |
|            | Simon Lubek     | Samira Mirtalaei  |
|            | Mark Schmitz    | Chi-Hui Wang      |
|            | Nikhil Sadhwani |                   |



|            |   |   |
|------------|---|---|
| 2006-2007: | Jaime Stovall<br>Kevan Bayne<br>Michael Germain   | Noel Pense<br>Jessie Helsey   |
| 2007-2008: | Sarah Balch<br>Kaycee Halla<br>Michael Kubany<br>Modesto Lopez  | Chrissy Hobson<br>Shari Lassiter<br>Matt Sondreaal  |
| 2008-2009: | Jason Clark<br>Alex Sitek<br>Manar Shahbandar   | Coleman Bessert<br>Greg Walton<br>Scott Kuhlman   |
| 2009-2010: | Osnat Artsi<br>Alan Busovaca<br>Cammi Kellar<br>Christine Randolph  | Benjamin Bosch<br>Jessica Butcher<br>Corina Prieto<br>Adrian Salazar  |
| 2010-2011: | Cameron Adler<br>Megan Anderson<br>Benjamin Cantrill<br>Eric Collinge<br>Barry Hancher<br>Jeremy Jellish<br>Laura Kuning<br>Benjamin O'Toole<br>Michael Trobiano<br>Shravan Sridhar | Raisa Ahmad<br>Nathan Bates<br>Tasha Chesko<br>Walter Hafner<br>Ashley Jaeger<br>Christopher Kennely<br>Jennifer Lehrman<br>Ben Teplistky<br>John Spanias |
| 2011-2012: | Mark O'Donnell<br>Marizza Bravo   | David Medina<br>Brad Rach   |

University of Kentucky:

Lawrence Jackson (undergraduate Kinesiology student; mentored independent research project, 2001-2002)

Julia Parakkat (undergraduate Biosystems and Agricultural Engineering student; mentored independent research project, 2001)

Lucas Kennedy (undergraduate Biology student; mentored independent research project, 2000)

Anne Schwarting (undergraduate Biology student; mentored independent research project, 1999)

Udesh deSilva (undergraduate Biology student; independent research project, 1998)

Edward C. Stites (undergraduate Math student; 1996 NSF REU program, 1997 sponsored independent research project; University of Kentucky)

Jason Neiser (undergraduate Physics student; 1997 NSF REU program).

Sarah Dean (undergraduate Math/Biomed. Eng. student; 1997 NSF REU program).

*Served on Graduate Committee:*

Harrington Department of Bioengineering, Arizona State University:

Ryan Knight, M.S., 2003, (Advisor: Jiping He, Ph.D.)  
Matthew Dixon, M.S., 2003, (Advisor: Gary Yamaguchi, Ph.D.)  
Jeremy Crandell, M.S., 2003, (Advisor: Gary Yamaguchi, Ph.D.)  
Patrick Koegler, M.S., 2004, (Advisor: Gary Yamaguchi, Ph.D.)  
Adam Bellanger, M.S., 2005 (Advisor: Ranu Jung, Ph.D.)  
Ganapriya Venkatasubramanian. M.S., 2005 (Advisor: Ranu Jung, Ph.D.)  
Helen Huang, PhD, 2006 (Advisor: Jiping He, Ph.D.)  
Joseph M. Guerricabeitia, M.S., 2006, (Advisor: James Sweeney, Ph.D.)  
Jeremy Crandell, M.S., 2007, (Advisor: Stephen Helms-Tillery, Ph.D.)  
Jacob Goble, PhD, 2007 (Advisor: Natalia Dounskia, PhD)  
Joseph Graham, PhD, 2008 (Advisor: Ranu Jung, Ph.D.)  
Kimberly Tan, M.S., 2009, (Advisor: James Sweeney, Ph.D.)  
Lubna Ahmad, PhD, 2009 (Advisor: Lokesh Joshi, Ph.D.)  
Mallika Fairchild, PhD, 2009 (Advisor: Ranu Jung, Ph.D.)  
Sivakumar Balasubramanian, PhD, 2009 (Advisor: Jiping He, Ph.D.)  
Lisa Raleigh, PhD, 2010 (Advisor: Marco Santello, PhD)  
Rashaad Sidique, M.S., 2010 (Advisor: Bruce Towe, PhD)  
Shawna Fletcher, M.S, 2010 (Advisor: Christopher Buneo, PhD)  
Simon Lubeck, M.S, 2010 (Advisor: Kevin Bennett, PhD)  
Samhavi Subramanian, M.S, 2010 (Advisor:Ranu Jung, PhD.)  
Brian Hillen, PhD, expected 2012 (Advisor: Ranu Jung, Ph.D.)  
Patrick Larson, PhD, expected 2012 (Advisor: Bruce Towe, PhD)  
Daniel Gulick, PhD expected 2013 (Advisor: Bruce Towe, PhD)  
Sindhu Anand, PhD, expected 2013 (Advisor: Jit Muthuswamy, PhD)

Department of Electrical Engineering, Arizona State University:

Niranjan Charkravarthy, PhD, 2007 (Advisor: Leon Iasemidis, PhD)  
Shivkumar Sebasan, PhD, 2008 (Advisor: Leon Iasemidis, PhD)

Department of Kinesiology, Arizona State University:

Mu Qiao, PhD, expected 2012 (Advisor: Devin Jindrich, PhD)

Institute of Biomaterials and Biomedical Engineering, University of Toronto:

Albert Vette, PhD, 2011 (Advisor: Milos Popovic, PhD)

Center for Biomedical Engineering, University of Kentucky:

Sarvani Grandhe, M.S., 1999, (Advisor: Ranu Jung, Ph.D.)  
Xiaobin Zhang, Ph.D., 2000, (Advisor: Eugene Bruce, Ph.D.)  
Heng Wang, M.S., 2000, (Advisor: Ranu Jung, Ph.D.)  
Nicole Cleary, M.S, 2002, (Advisor: Eugene Bruce, Ph.D.)  
Kegang Hua, M.S., 2002, (Advisor: Dayong Gao, Ph.D.)

Department of Electrical Engineering, University of Kentucky:

Hock Jin Lee, M.S., 1997, (Advisor: Elizabeth J. Brauer, Ph.D.)

Department of Kinesiology and Health Promotion, University of Kentucky:

Elizabeth A. Knapp, M.S. 1996, (Advisor: Robert Shapiro, Ph.D.)

Timothy Brindle, Ph.D., 2001, (Advisor: Robert Shapiro, Ph.D.)

Department of Mechanical Engineering, The Catholic University of America:

Thang Dang, M.S., 1994, (Advisor: Jack Winters, Ph.D.)

*Served on Undergraduate Honors Thesis Committee:*

Harrington Department of Bioengineering, Arizona State University:

Taryn Jansen, BS, Barrett Honors College Thesis, 2004 (Advisor: Ranu Jung, PhD)

Charles McCartney, BS, Barrett Honors College Thesis, 2005 (Advisor: J. Davidson)

Speech & Hearing Sciences, Arizona State University:

Cynthia Dana, BS, 2003, Barrett Honors College Thesis (Advisor: M. Dorman, PhD)

Department of Kinesiology, Arizona State University:

Travis Johnson, BS, 2005, Barrett Honors College Thesis (Advisor: Kathleen Matt, PhD)

Brian Brown, BS, 2010, Barrett Honors College Thesis (Advisor: Devin Jindrich, PhD)

Lisa Schroeder, BS, 2012, Barrett Honors College Thesis (Advisor: Richard Hinrichs, PhD)

Department of Psychology, Arizona State University:

Stanley Brewer, BS, 2008 Honor Thesis (Advisor: Eddie Casteneda, PhD)