



**P. Hunter Peckham, Ph.D.**

**EDUCATION**

Ph.D. - Biomedical Engineering, Case Western Reserve University - --(b)(6)--  
M.S. - Engineering, Case Institute of Technology - --(b)(6)--  
B.S. - Mechanical Engineering, Clarkson College of Technology - --(b)(6)--

**PROFESSIONAL EXPERIENCE**

2005 – present	Donnell Institute Professor of Biomedical Engineering, Case Western Reserve University
2000 – present Center	Senior Research Career Scientist, Cleveland VA Medical
1996 - present Staff	Director of Orthopaedic Research, Member Bio-scientific MetroHealth Medical Center
1993 – 2002 Corporation	Founder and Member, Board of Directors, NeuroControl
1989 - present	Director, FES Center of Excellence Louis Stokes Department of Veterans Affairs Medical Center
1988 - present	Professor of Biomedical Engineering Case Western Reserve University, Cleveland, OH
1988 - present	Professor of Biomedical Engineering in Orthopaedics (secondary appointment) Case Western Reserve University, Cleveland, OH
10/07 – 3/08	Interim Chair, Department of Biomedical Engineering School of Engineering, Case Western Reserve University
1983 - 1988	Associate Professor of Biomedical Engineering Case Western Reserve University
1981 – 1993	Director, Rehabilitation Engineering Center, Case Western Reserve University, Cleveland, OH
1979 - 1983	Assistant Professor of Biomedical Engineering CWRU, Cleveland, OH
1978 - 1988	Assistant Professor of Biomedical Engineering in Orthopaedics CWRU, Cleveland, OH
10/81 - 2001	Research Biomedical Engineer, Research Service Cleveland Veterans Administration Medical Center, Cleveland, OH

- 1974 - 1979 Senior Research Associate, Engineering Design Center and Department of Biomedical Engineering, CWRU, Cleveland, OH
- 1974 - 1978 Instructor, Division of Orthopaedic Surgery, CWRU, Cleveland, OH
- 1972 - 1974 Research Associate, Engineering Design Center and Department of Biomedical Engineering, CWRU, Cleveland, OH

### **professional interest**

Rehabilitation engineering in spinal cord injury, neural prostheses, and functional electrical stimulation

### **HONORS AND AWARDS**

- Pi Tau Sigma - Honorary Mechanical Engineering Society  
 American Spinal Injury Association (ASIA) - Honorary Member. 1986  
 Association of Independent Colleges and Universities of Ohio - Research Award  
 American Institute of Medical and Biological Engineering (AIMBE) –Fellow, 1993  
 State of Ohio Assembly, House of Representatives of the 122<sup>nd</sup> General Assembly, Special Recognition, Pioneer of the Neuroprosthesis, 1997  
 US Dept. Health and Human Services, Public Health Service, NIH/NICHD, National Advisory Board on Medical Rehabilitation Research Service Award, 6/97  
 Enterprise Development Inc., Innovation Award, 4/98  
 Food and Drug Administration Commissioner's Special Citation - 5/98  
 RESNA - Leadership Award, 6/98  
 Northern Ohio Live, Award of Achievement in Science and Technology, 9/98  
 Design News, Engineer of the Year, 3/00  
 Department of Veterans Affairs, Paul Magnuson Award, 4/01  
 State of New South Wales, Australia, Citation for Extraordinary Contribution, 5/01  
 Prime Minister of Australia, Letter of Appreciation, 5/01  
 National Academy of Engineering, Elected 2002  
 Stevens Institute of Technology, Stevens Honor Award, 2002  
 American Congress of Rehabilitation Medicine, Sidney and Elizabeth Licht Award for Excellence in Scientific Writing, 10/02  
 Maurice Saltzman Award – awarded to the Cleveland FES Center by the Mt. Sinai Health Care Foundation, 2004  
 Donnell Institute Professor of Biomedical Engineering, 2005-2010  
 Golden Knight Award, Clarkson University, July 2006  
 World Technology Network, Award in Health and Medicine, 2006  
 Frank and Dorothy Humel Hovorka Prize, Case Western Reserve University, 2009  
 Distinguished University Professor, Case Western Reserve University, 2010

### **PROFESSIONAL SOCIETIES**

- American Paraplegia Society  
 International Medical Society of Paraplegia  
 Rehabilitation Engineering Society of North America  
 Institute of Electrical and Electronic Engineers  
 Fellow - American Spinal Injury Association  
 Biomedical Engineering Society  
 International Functional Electrical Stimulation Society  
 American Institute for Medical and Biological Engineering

National Academy of Engineering

## **RESEARCH**

### ***CURRENT RESEARCH FUNDING:***

Principal Investigator - Center of Excellence in Functional Electrical Stimulation.  
Department of Veterans Affairs, 10/02-9/12

Senior Research Career Scientist Award – Department of Veterans Affairs, salary only,  
4/1/00 – 3/31/14

Principal Investigator - Neural Interfaces Conference, NINDS-Stroke Special Emphasis  
Panel  
9/1/07-9/11

Principal Investigator - Multi-functional Neuroprosthetic System for Restoration of Motor  
Function. NINDS 1U13NS060636, 6/10 – 5/15

Principal Investigator – Restoration of Upper Extremity Function, Craig H. Neilsen  
Foundation, 7/10 – 7/12

### ***Current Training Grants:***

Mentor - Multidisciplinary Clinical Research Training Program (MCRTP), Cleveland  
Clinic Foundation, K-12, RR023264 (--(b)(6)--- PI), 7/1/07 –

Mentor – Training Program in Musculoskeletal Research, Case Western Reserve  
University, T-32, AR007505-21, (--(b)(6)--- PI), 5/11/07-4/30/12

Mentor – Medical Scientist Training Program (MSTP), Case Western Reserve  
University, T-32, (--(b)(6)-- – PI),

Mentor – Integrated Engineering and Rehabilitation, Case Western Reserve University,  
T32EB004314, (--(b)(6)-- – PI), 7/1/99-6/30/09

### ***COMPLETED:***

#### **FDA**

Principal Investigator - Restoration of Hand-Arm Function with Neuroprostheses, Food  
and Drug Administration, Orphan Products Division, FD-R-002389, 9/30/03-9/29/06.

Principal Investigator - Implantable Systems for Restoration of Hand Function. FDA

Grant #FD-000832-01, 9/30/92-9/30/96.

## **STATE OF OHIO**

Principal Investigator, State of Ohio, Neurostimulation and Neuromodulation Partnership, BRTT BRTT03-10, 7/1/03-6/30/07

Principal Investigator - Biomedical Research and Commercialization Program, BRCP06-22, State of Ohio, 7/06-6/10

## **NATIONAL INSTITUTES OF HEALTH**

Co-Principal Investigator - Intramuscular Electrical Stimulation of Skeletal Muscle (--(b)(6)--- Principal Investigator). NIH-NINCDS (N01-NS-2-2314) Neural Prosthesis Program. 1972-1980.

Investigator - Microelectronics Laboratory for Biomedical Sciences (--(b)(6)--- Project Director). Implant Stimulator for the Disabled NIH-NIGMS - GM14267, 1974-1975.

Principal Investigator - Microelectronics Laboratory for Biomedical Sciences. (--(b)(6)-- Project Director). Functional Stimulation Systems for Excitation of Skeletal Muscle. NIH-NIGMS. 1975-1981.

Co-Principal Investigator - Functional Neuromuscular Stimulation. (J.T. Mortimer - Principal Investigator) NIH-NINCDS, N01-NS-0-2330) Neural Prosthesis Program. 1980-1983.

Co-Principal Investigator - Functional Activation of the Paralyzed Upper Extremity - National Institute of Health, N01-NS-3-2344. Restoration of Upper Extremity Control by Functional Neuromuscular Stimulation (--(b)(6)--, Principal Investigator) 1983-1986.

Co-Principal Investigator - Force and Position Transducers for Use on the Paralyzed Hand. National Institute of Health N01-NS-3-2345 (--(b)(6)--, Principal Investigator) 1984-1986.

Principal Investigator - Implantable Systems for Stimulation of Skeletal Muscle. National Institute of Health, R01-NS17955, 1985 -1988.

Co-Principal Investigator - Artificial Sensory Transducers. National Institute of Health NINCDS-85-29 (--(b)(6)--, Principal Investigator) 1986-1989.

Co-Principal Investigator - Closed Loop Control of Functional Neuromuscular Stimulation. National Institute of Health N01-NS-6-2303, 1986 -1989

Co-Principal Investigator - National Institute of Health, (FNS Control) Grant #N01-NS-9-2356, Functional Neuromuscular Stimulation for Restoration of Hand Grasp, 8/21/89 to 8/20/92.

Principal Investigator - Multichannel Implantable System for Neural Control. National

Institutes of Health, NS29549, 1991-1994.

Principal Investigator - Multichannel Implantable System for Neural Control, National Institute of Health, 2R01 NS29549, 4/99-04.

Co-Principal Investigator – Restoration of Hand and Arm Function by Functional Neuromuscular Stimulation, NIH Contract (--(b)(6)--, PI), 6/01 – 5/05

Principal Investigator - Development of Networked Implantable Neuroprosthesis, NIH/NIBIB, BRP, #EB001740-05, 9/01 – 2/10

Co-Investigator - Restoration of Hand and Arm Function by Functional Neuromuscular Stimulation. NIH-NINDS-05-03, (--(b)(6)-- - PI), 10/1/2005 – 9/30/2010

Co-Investigator - Controller Development for Upper Limb Movement. NICHD-2005-05 (--(b)(6)--- PI), 10/1/2005 – 9/30/2010

## **DEPARTMENT OF VETERANS AFFAIRS**

Principal Investigator - Patient Evaluation of a Functional Electrical Stimulation Hand Orthosis. Veterans Administration. 1976-1978.

Principal Investigator - Development of Upper Extremity Orthoses Employing Electrical Stimulation. Veterans Administration. 1978-1981.

Principal Investigator - Functional Neuromuscular Systems for Upper Extremity Control. Veterans Administration Rehabilitation Research and Development Program. 1981-1984.

Principal Investigator - Functional Neuromuscular Systems for Upper Extremity Control. Veterans Administration Rehabilitation Research and Development Program, 1984-1987.

Principal Investigator - Functional Neuromuscular Systems for Upper Extremity Control. Veterans Administration Rehabilitation Research and Development Program, 1988-1991.

Principal Investigator - Center of Excellence in Functional Electrical Stimulation. Department of Veterans Affairs, 10/90-10/97.

Principal Investigator - Center of Excellence in Functional Electrical Stimulation. Department of Veterans Affairs, 10/97-9/02.

Co-Investigator - Functional Neuromuscular Systems for Upper Extremity Control. Veterans Administration Rehabilitation Research and Development Program, #B011-5RA, 10/91-9/94.

Principal Investigator - Functional Neuromuscular Systems for Upper Extremity Control. Veterans Administration Rehabilitation Research and Development Program, #B011-6RA, \$1,042,273, 10/1/94 - 4/98.

Principal Investigator - Magnuson Award (Peckham-PI), \$150,000 total award, 4/01-9/03

Principal Investigator – Implantable FES for Control of the Extremities in Spinal Cord Injury. Department of Veterans Affairs, B2725R, 1/02 – 9/05

Principal Investigator – Implanted Myoelectric Control for Restoration of Hand Function in SCI. Department of Veterans Affairs, 1/05-1/08

## **NATIONAL INSTITUTE OF HANDICAPED RESEARCH/NATIONAL INSTITUTE ON DISABILITY AND REHABILITATION RESEARCH**

Co-Director - Rehabilitation Engineering Center for Control of Mobility and Environment. (---(b)(6)--- Project Director) Rehabilitation Services Administration. 1977-1982. (P.H. Peckham - Director - Rehabilitation Engineering Center for Control of Mobility and Environment -National Institute of Handicapped Research. 1981-1982.)

Director - Rehabilitation Engineering Program for Restoration of Upper Extremity Control. National Institute of Handicapped Research, (G008300118-84) 1983-1988.

Principal Investigator - Rehabilitation Engineering Center: Functional Electrical Stimulation for Restoration of Neural Control. National Institute on Disability and Rehabilitation Research, H133E80020, 1988-1993.

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## **CLEVELAND FOUNDATION**

Director - Rehabilitation Engineering Service Delivery for the Severely Disabled - Cleveland Foundation Grant No. 85-591-31R, 1983-1984.

## **SPINAL CORD RESEARCH FOUNDATION**

Principal Investigator - Implantable Sensor for Two Degree of Freedom Position Transduction. Spinal Cord Research Foundation, 1986-1988.

Principal Investigator - Implantable Sensor for Two Degree of Freedom Position Transduction. Spinal Cord Research Foundation, 1989-1990.

Principal Investigator - Multichannel Implantable System for Neural Control. Spinal Cord Research Foundation, #1053. 7/1/92-6/30/94.

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## **SERVICE COMMITTEES - Internal**

Research Committee - Dean's Committee Designate, Cleveland Veterans

Administration Medical Center. 1977-1981, 1984-1988.

Equipment Committee - Veterans Administration Medical Center, 1977

Safety Committee - Cleveland Metropolitan General/Highland View Hospital, Cleveland, OH.

Clinical Engineering Committee - Department of Biomedical Engineering, Case Western Reserve University, Cleveland, OH.

Committee on Investigation in Humans (Institutional Review Board), Cleveland Metropolitan General/Highland View Hospital, Cleveland, OH, 1983 - 1988.

Committee on Rehabilitation Medicine - School of Medicine, Case Western Reserve University, 1984 - 1988

Graduate Education Committee, Biomedical Engineering, Case Western Reserve University, Cleveland, OH, 1983 - . Chairman 1985 - 1988.

Executive Committee - Colleges of CWRU, June 1987 - May 1989.

Chronic Care Subcommittee, Highland View Hospital, 1986 – 1998

Research Committee – Department of Orthopaedics, CWRU, 1990

Faculty Senate Committee on Research, CWRU, 1988 – 1991

President's Advisory Committee for Promotion and Tenure (Faculty of Humanities, Arts and Social Sciences) 1991

Research Committee, School of Engineering, 9/93-5/94

Executive Committee, School of Engineering, 9/94-5/95

Advisory Board, The Case Engineering Support Group, 1994

Institutional Review Board, Health Hill Hospital 8/95-8/96

MetroHealth Center for Rehabilitation (MHCR) 1997-1998

Research Advisory Committee, Rammelkamp Center for Education and Research, MetroHealth Medical Center, 1998 – Present

Graduate Education Committee (Chairman), Case School of Engineering, 7/98-6/99

Member, General Clinical Research Center, Advisory Committee, SOM, 6/99-Present

Faculty Council, School of Medicine, 1998-2001

Nash Endowment Fund Advisory Committee, MetroHealth Medical Center, 2000 – 2001

Case School of Engineering, Appointments (Promotion & Tenure) Committee, 5/00 – 01

Graduate Education Committee, Department of Biomedical Engineering, 9/00

Honorary Degree Committee, CWRU, 2002-03

Provost's Commission on Research and Graduate Programs, CWRU, 2002-03

President's Advisory Committee on Promotion and Tenure, CWRU, 2003

Case Advanced Power Institute (CAPI) Faculty Advisory Board, 4/03- 4/04

Academic Careers in Engineering and Science (ACES) Steering Committee and Co-Principal Investigator, NSF Advance Transformational Award, 10/03 – Present

Development Activities, Assistance in CSE development opportunities with potential donors, 2003-04

Chairman, Department of BME Ford Lectureship Committee, 4/04 – 10/05

SOM Deans Strategic Planning Group, School of Medicine, and VA Medical Center, 7/04-5/05.

Provost Research Council, Fall 2004 – Spring 2008

Case School of Engineering Strategic Planning Committee, 9/04-6/05

CWRU Conflict of Interest Advisory Committee, 9/04 - Present

MHMC Development, Vision Advocacy Council (VAC), MHMC, 2005 – Present

Case School of Engineering, Appointments, Promotion, and Tenure Committee, 2005-2006

Symposium Organizer, Case Western Reserve University 125<sup>th</sup> Anniversary, "challenges in Bringing New Concepts to Market", May 2005

MetroHealth Research Institute, Board of Directors 2005 - Present

Case National Academies Advisory Council, December 2006 – present

President's Task Force on Conflict of Interest and Conflict of Commitment at Case Western Reserve University, 2008 – 2009

Case School of Engineering, Appointments (Promotion & Tenure) Committee, 2009 –

Deans Research Council, Case School of Engineering, 2009 –

Chair, Engineering Faculty Hiring Initiative, Case Western Reserve University, 2010

## **SEARCH COMMITTEES**

Chairman, Department of Biomedical Engineering, Case Western Reserve University, 1985  
Dean, School of Engineering, Case Western Reserve University  
Chairman, Department of Orthopaedics, MetroHealth Medical Center, 1998-99  
Director, National Center for Medical Rehabilitation Research, NICHD/NIH, 1998-99  
Associate Chief of Staff for Research, Cleveland VA Medical Center, 1999-00  
Chemical Engineering Chairman Search, CWRU, 1999-00  
Chairman, Physical Medicine and Rehabilitation, MetroHealth Medical Center, 1998-01  
Case School of Engineering – Member of Nord Chair Search Committee, 2003/04  
Associate Chief of Staff for Research, Louis Stokes VA Medical Center, 2005  
Presidential Search Committee, Case Western Reserve University 2006  
Chairman, Department of Biomedical Engineering Search Committee, Case Western Reserve University, 2007  
Chairman, Provost Search Committee, Case Western Reserve University, 2008  
Chairman, Department of Medicine, MetroHealth Medical Center, 2009-2010

## **EXTERNAL RESPONSIBILITIES**

Site Visitor, Neural Prosthesis Center, Barrows Neurological Institute, Phoenix, Arizona, November 29, 1990.

Conference Co-Chairman, Engineering Foundation Conference on Neural Prostheses: Motor Systems III, Banff, Alberta, Canada, August, 1991.

Developed Technical Specifications for NASA RFP #5-86176/238

Conference Chairman, Engineering Foundation Conference on Neural Prostheses: Motor Systems IV, Mt. Sterling, OH, July, 1994.

Conference Chairman, First Annual IFESS Society Meeting, Cleveland, OH, May, 1996.

Co-Chair, Rehabilitation and Assistive Technology Panel, NIH BioEngineering Consortium (BECON), "Bioengineering Research: Building the Future of Biology & Medicine", Bethesda, MD, 2/27-28/98.

Co-Chair, ASIA Pre-meeting Course "Restoring Limb and Bladder Function with Electrical Stimulation", Cleveland, OH 4/19/98.

Scientific Chairman, VI International Conference on Surgical Rehabilitation of the Upper Limb in Tetraplegia, Cleveland, OH 5/20-23/98.

Site Visitor, Seattle, Washington VA Rehab R&D Center for Excellence in Amputation, Prosthetics, and Limb Loss Prevention, 9/14-15/98.

Co-Chair, Rehabilitation Engineering Track, BMES 98 Meeting, Cleveland, OH, September 1998.

Co-Chair, Inaugural Meeting of the Rehabilitation Research and Development Service, Washington, DC, October, 1998.

Site Visitor, VA Rehab R&D Centers, (3 sites): Pittsburgh, PA; Bronx, NY; West Haven, Conn. 5/99.

Moderator, NCMRR/NIH, Medical Rehabilitation on the Move: Spotlight on Bioengineering. Special Session: Generation of Movement, 1/4–5/01.

Moderator, Special Session: Neural Repair and Functional Restoration Workshop – Bridging the Gap, International Functional Electrical Stimulation Society: Envisioning a New Century of Breakthroughs. 6/17-20/01.

Co-Lead Workshop, Whitaker Foundation Biomedical Engineering Research Conference, “Entrepreneurs in Biomedical Engineering”, La Jolla, CA, 8/9-12/01.

NCMRR/NIH, Training Meeting, Mock Study Section Panel Member, December 5, 2001.

Engineering Research Centers (ERC) Blue Ribbon Panel, National Science Foundation, Arlington, Virginia, 1/03 – 4/03; ERC site visitor, 2004; ERC site visitor, 2005.

Fritz J. and Dolores H. Russ Prize Committee, National Academy of Engineering (NAE), 1/03 - present

Institute of Medicine Panel Member, The National Academy Committee on Spinal Cord Injury. 10/03-10/05

Foundation for Physical Medicine and Rehabilitation, Program Advisory Committee for the Physical Medicine and Rehabilitation Research Summit, 12/10/03 – 12/05

IEEE James H. Mulligan, Jr. Education Medal Committee, 10/04 – 10/07

Steering Committee and Chairman, Arrangements Committee, NAE Regional Conference on Energy (conference 5/05)

Steering Committee and Chairman, Arrangements Committee, NAE/IOM Regional Conference on Vaccine Production (conference 4/06)

Chairman, VA Center Directors Meeting, VA Central Office, Cleveland, OH Oct. 2004

Institute of Medicine, The National Academies Panel Member on “Disability in America”, 1/05 - Present

Chairman, National Academy Keck Futures Initiative (NAKFI) Conference, Smart Prosthetics, 10/05-11/07

Member, Steering Committee, and Chairman, Arrangements Committee, National Academy of Engineering and Institute of Medicine Topical Conference, “Vaccine Production: Potential Engineering Approaches to a Pandemic”, Cleveland, Ohio April 10-11, 2006.

Symposium Organizer, AAAS Annual Meeting, “Smart Prosthetics”, San Francisco, CA, February, 2007.

Meeting Facilitator/Organizer, Presidents' Circle of the National Academies, Smart Prosthetics: Exploring Assistive Devices for the Mind and Body, Woods Hole, MA, June 10-12, 2007

Meeting Chairman and Steering committee Chairman, 38th, Neural Interfaces Conference, Cleveland, OH, June 16-19, 2008.

Steering Committee, Neural Interfaces Workshop, Long Beach CA, June 21-23, 2010

Moderator, Neuromodulation Challenges and Future directions, NANS, Las Vegas, December 3-4, 2010.

NAKFI Seed Grant Review Working Group, National Academy of Engineering, 2011 –

Member, Technology and Mobility Committee, 2011 International Conference on Spinal Cord Medicine and Rehabilitation, June 4-8, 2011

### **EXTERNAL ADVISORY**

Emeritis Consultant, Movement Disorder Foundation, Sydney, NSW, Australia, 1989 - present

Scientific Advisory Board, Miami Project, University of Miami, Miami, Fla, 1991 - 1993

External Advisory Committee, National Research Services Award Institutional Training Grant in Medical Rehabilitation Research, NICHD, University of Michigan, Dept. PM&R, National Research Services, 1991 - 1996.

Scientific Advisory Panel, Spinal Cord Society, Fergus Falls, Minnesota, 1985 – 1995.

National Advisory Board, National Center for Medical and Rehabilitation Research (NCMRR), National Institutes of Health, 1993-1997, Chairman 1996-1997

National Institute of Child Health and Human Development Council, NCMRR Liaison, 4/96-4/97.

American Spinal Injury Association, Research Committee, 1995 - present

Advisory Committee, Oversight Working Group, Musculoskeletal and Dental Sciences IRG, National Institutes of Health, 6/98 – 2000

Advisory Board, Center for an Accessible Society, Accessible Society Action Project, Exploding Myths, Inc. (NIDRR Center), 1999 –

NIH Center for Scientific Review Oversight Committee, (Revision of NIH review process) 1999-2000

Scientific Advisory Board, Kessler Medical Rehabilitation Research & Education Corporation, 2000 - 2008

NIH, National Institute of Neurological Disorders and Stroke, Repair and Plasticity

Planning Panel, NIH/NINDS, 2/18/00

Site Visitor, Murdock Charitable Trust, merger of Oregon Health Sciences University and Oregon Graduate Institute, 1/01.

Advisory Board, NIH/NCRR Center for Neural Communication Technology, University of Michigan, 11/01 – 11/04

Advisory Board, University of Florida, Brooks Center for Rehabilitation Studies, 2002 - present

Advisory Board, Integrated Graduate Education and Research Training Program NSF (IGERT), Arizona State University, 3/02 – 3/04

Scientific Advisory Board, Shriners Hospital for Children, 10/02 – Present

Scientific Staff, Shriners Hospital for Children, 7/04 - Present

Deans Advisory Council, School of Arts and Sciences, Clarkson University, 4/05 – 4/10

Ex Officio Member, NIH/NIBIB Advisory Council, 3/06 – Present

Tech Leaders Initiative Meetings, Nortech 2/05 – 4/07

Scientific Advisory Board, Center for Neural Communication Technology, University of Michigan, 2008 -

Member, National Research Council, Committee on the Role of Human Factors in Home Healthcare, The National Academies, 2009

Field Representative, Field Research Advisory Committee (FRAC), Department of Veterans Affairs, 5/07 – Present

National Research Advisory Council (NRAC), Department of Veterans Affairs, 5/07 – Present

Integration Panel Member, SCIRP, Department of Defense, 4/10 –

Member, Advisory Board, NDI Medical, 2010 -

Brain Rehabilitation Research Center (BRRC), Rehab R&D Service, Department of Veterans Affairs, 2010 –

Member, Advisory Board, Electric Stimulation Study, Frazier Rehabilitation Institute, Louisville, KY, 2010 –

Member, Scientific Advisory Committee, AHFMR Interdisciplinary Team in Smart Neural Prostheses, University of Alberta, Edmonton, 2010 –

## **GRANT REVIEWER**

Spinal Cord Research Foundation, 1990

NIH SBIR Reviews, Bethesda, MD, 3/89, 3/91, 5/91

National Institutes of Health, Bethesda, MD, 6/92, 12/92, 6/93

Spinal Cord Society, 1993

National Science Foundation, 5/94

Medical Research Council of Canada,, 1/95

Incontact – National Action on Incontinence, London, England, 7/96

London Life Medical Research Award, London, Ontario, Canada, 10/97

Medical Research Council of Canada, 12/97

Research Career Scientist Awards, Department of Veterans Affairs, Rehab R&D Service, 11/98

Geriatrics & Rehabilitative Medicine (GRM) Study Section, NIH, Washington, DC, 2/25/99

Special Emphasis Panel, Center for Scientific Review, NIH, Silver Spring, MD, 7/8-9/99

NIH Studies Sections: Geriatrics and Rehab Medicine Study Section, Orthopaedics and Musculoskeletal Study Section, 6/26-27/00.

Department of Veterans Affairs, Rehabilitation Research Associated Health Predoctoral Fellowship Program, , September, 9/00

NIH, Center for Scientific Review, Study Section Reorganization, Working Group on Skeletal Muscle Biology, 3/15-16/01

NIH, Center for Scientific Review, Study Section Reorganization, Integrated Review Group on Bone, Muscle, Connective Tissue and Skin Boundaries Team, 7/11-13/01

NCMRR Concept Review, Panel Chair, FES Controller of Cortical Implant Signals, 7/04

Department of Veterans Affairs, Merit Review Award Reviewer

Danish Research Council

NIH Grant review

Department of Veterans Affairs, R & D Center Reviewer

### **EDITORIAL BOARDS:**

Editorial Board, Paraplegia, August, 1991 - 1995

Associate Editor, IEEE Trans on Rehabilitation Engineering, 1993-1998

Editorial Board, Regenerative Medicine, 1999-2000

Editorial Board, Journal Rehab Research & Development, 1999-2006

**SCIENTIFIC REVIEWER:**

IEEE Transactions on Biomedical Engineering  
IEEE Transactions on Rehabilitation Engineering  
Journal of Biomechanics  
Journal of Rehabilitation Research and Development  
Medical and Biological Engineering and Computing  
Neuromodulation  
Annals of Biomedical Engineering and Physics  
Journal of Spinal Cord Medicine,  
Journal of the International Federation for Medical & Biological Engineering

**GRADUATE STUDENTS/FELLOWS:**

**Ph.D.**

**Date  
Graduated**

--(b)(6)--

**M.S.**

--(b)(6)--

**Post Doctoral Fellows**

--(b)(6)--

**Advisory/Examination Committee:**

--(b)(6)--

**High School Senior Projects**

--(b)(6)--

**Courses (Case Western Reserve University):**

EBME 105 Introduction to Biomedical Engineering  
EBME 307 Biomechanical Prosthetic Systems  
EBME 313/ Biomedical Engineering Lab  
314  
EBME 380 Design for Biomedical Engineers  
EBME 427 Rehabilitation Engineering  
EBME 451 Physiological Systems  
EBME 454 Control of Orthotic/Prosthetic Systems  
EBME 507 Motor System Neuroprostheses  
EBME 602 Introduction to Rehabilitation

**PATENTS**

Intramuscular Electrode for Neuromuscular Stimulation System. WD Memberg, PH Peckham, MW Keith. Patent #4,989,617, 2/5/91.

Functional Neuromuscular Stimulation System. PH Peckham, B Smith, JR Buckett, GB Thrope, J Letechipia. Patent #5,167,229, 12/1/92.

Functional Neuromuscular Stimulation System. PH Peckham, B Smith, JR Buckett, GB Thrope, J Letechipia. 5769875 6/23/98

Functional Neuromuscular Stimulation System With Shielded Percutaneous Interface, File No.: 9375.17219-DIV CON 2, NeuroControl Corporation, Serial No.: 09/009,797, Filing Date: 1/20/1998, Patent No.: 6,026,328, 2/15/2000

Functional Neuromuscular Stimulation System File No.: 9375.17219-DIV CON 2, NeuroControl Corp., Serial No.: 09/694,380, Patent #US 6,718,210 B1, 4/6/04

Functional Neuromuscular Stimulation System, File No.: 9375.17219-DIV CON 2, NeuroControl Corp., Serial No.: 09/009,574, 12/19/2000

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Implantable Networked Neural System, Kevin Kilgore, Hunter Peckham, Tim Crish, Brian Smith"US Patent No. US 7,260,436 - Issued: 8/21/2007

## **THESIS**

Peckham, P.H., "Design Consideration in Electrical Stimulation of Skeletal Muscle". Case Western Reserve University, Report No. EDC 4-68-23, June, 1968.

Peckham, P.H., "Electrical Excitation of Skeletal Muscle: Alterations in Force, Fatigue and Metabolic Properties". Case Western Reserve University, Report No. EDC 4-72-32, June, 1972.

## **PUBLICATIONS**

Gibbons D.F., Peckham PH, Martin R.L.: Vitreous carbon percutaneous electrodes for muscle Stimulation, J.Biomedical Materials Res. Symp., 3:155-164, 1972.

Mortimer JT, Peckham PH: Electrical excitation of paralyzed muscle. Advances In External Control of Human Extremities, Published ETAN, Belgrad, 1972.

Peckham PH, Mortimer JT, Van Der Meulen J.P.: Physiologic and metabolic changes in white muscle of cat following induced exercise. Brain Research 50:424-429, 1973.

Mortimer JT, Peckham PH: Percutaneous conduction of electrical signals: interface techniques and tissue reaction at electrode site. Research Animals in Medicine, Edt. L.T. Harmison, U.S. Department of Health, Education, and Welfare, Publication No. (NIH) 72-333, 1973.

Van Der Meulen J.P., Peckham PH, Mortimer JT: Use and disuse of muscle. Trophic Function of the Neuron, Edt. D.B. Drachman, 228:177-189, 1974.

Crago P.E., Peckham PH, Mortimer JT, Van Der Meulen J.P.: The choice of pulse duration for chronic electrical stimulation via surface, nerve and intramuscular electrodes. Annals of BME 2:252, 1974.

Peckham PH, Mortimer JT, Marsolais EB: Alteration in the force and fatigability of skeletal muscle in quadriplegic humans following exercise induced by chronic electrical stimulation. Clin Ortho & Related Res 114:326-334, 1976.

Peckham PH, Marsolais EB, Mortimer JT: Upper and lower motor neuron lesions in the upper extremity in quadriplegics. Paraplegia 14:115-121, 1976.

Freehafer AA, Peckham PH, Keith M.: Determination of muscle-tendon unit properties during tendon transfer. J. Hand Surg, 4(4): 331-339, July, 1979.

Peckham PH, Marsolais EB, Mortimer JT: Restoration of key grip and release in the c6 quadriplegic through functional electrical stimulation. J. Hand Surg. 5:462-469, September, 1980.

Peckham PH, Mortimer JT, Marsolais EB: Controlled prehension and release in the c5 quadriplegic elicited by functional electrical stimulation of the paralyzed forearm musculature. Annals of BME 8:369-388, 1980.

Crago PE, Mortimer JT, Peckham PH: Closed-loop control of force during electrical stimulation of muscle. IEEE Trans. Biomed. Eng. BME-27(6):306-312, 1980.

Crago P.E., Peckham PH, Thrope GB: Modulation of muscle force by recruitment during intramuscular stimulation. IEEE Trans. Biomed. Eng. BME-27(12):679-684, December, 1980.

Peckham PH, Poon CW, Ko WH, Marsolais EB, Rosen J.J.: Multichannel implantable stimulator for control of paralyzed muscle. IEEE Trans. Biomed. Eng. BME-28(7):530-536, 1981.

Peckham PH: Functional neuromuscular stimulation: an overview. Physics in Technology 12:114-121, 1981.

Thrope GB, Buckett JR, Peckham PH: Tape recorder control for persons with limited hand function. Arch. Phys. Med. and Rehab 63:495, 1982.

Peckham PH: Restoration of upper extremity function. Eng. in Med. and Biol. 2:30-32, 1983.

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Neural Organization and its Relevance to Prosthetics, Houston Neurological Symposium, Houston Texas, March, 1973.

Care of the Spinal Cord Injury Patient. Sponsored by Veterans Administration, Palo Alto, California, April, 1975.

Workshop on Functional Electrical Stimulation. Sponsored by NIH-NINCDS and RSA, Pomona, California, May, 1976.

Instructor, American Academy of Orthopaedics Surgery Continuing Education Course on the Spinal Cord Injury Patient, Miami, Florida, November, 1976.

Cybernetic Models of the Human Nervous System, Engineering Foundation Conference, Henniker, New Hampshire, August, 1977.

Instructor, Care of the Spinal Cord Injury Patient, Rehabilitation Institute of Chicago, Chicago, Illinois, September, 1977.

Winter Conference on Brain Research, Keystone, Colorado, January, 1978.

Third Congress of the International Rehabilitation Medicine Association Symposium on Functional Disorders in the Upper Limbs in Tetraplegia, Basel, Switzerland, July, 1978.

Interagency Conference on Rehabilitation Engineering, Seminar on Functional Electrical Stimulation, Washington, D.C., September, 1978.

31st Annual Conference on Engineering in Medicine and Biology, Workshop on Electroprostheses: Theory and Practice, October, 1978, Atlanta, Georgia.

Merck Conference on Clinical Orthotics: The Science and Art, Chedoke Hospitals, Hamilton, Ontario, September, 1979.

Workshop on Implantable Transducers and Systems: Closed Loop Physiological Control, "Electrical Excitation of the Motor System: Application to Quadriplegic Patients". Case Western Reserve University, Cleveland, OH, June, 1980.

Conference on Independent Living and Accessibility for Physically Disabled People, "Implications of Technology on Independent Living", Cleveland, OH, June, 1980.

Visiting Professor of Neurosurgery, "Functional Neuromuscular Stimulation of the Disabled, University of Arkansas, Little Rock, Arkansas, November, 1980.

Medical Tuesday, "Rehabilitation Engineering - Functional Restoration of the Disabled Through Modern Technology", Cleveland Metropolitan General/Highland View Hospital, March, 1981.

NATO Advanced Study Institute in Spinal Cord Injury Rehabilitation Engineering, "Electrical Stimulation for Functional Control of Upper Limbs", Stoke-Mandeville National Spinal Injury Centre, Aylesbury, England, May, 1981.

Workshop on Emerging Technology in Neuroprostheses, "Neural Prostheses for Motor Control", Case Western Reserve University, Cleveland, OH, September, 1981.

Neural Prosthesis Workshop, National Institutes of Health, Bethesda, Maryland, 1974-1984.

National Academy of Science - Yugoslav Council of Akadimes Joint Workshop on "Movement in Man and Machine". Protoroz, Yugoslavia, May, 1982.

Veterans Administration Workshop on Functional Electrical Stimulation. Washington, D.C., October 12-13, 1982.

Hillside Hospital - "Clinical Work at the Cutting Edge of Biomedical Engineering Research", Warren, OH, December, 1982.

Gordon Research Conference on Science and Technology of Biomaterials, "Biomaterials for Neural Prostheses, Functional Neuromuscular Stimulation in a Mechanically Stressful Environment", Plymouth, New Hampshire, July 6, 1983.

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Frontiers of Engineering and Computing in Health Care - Restoration of Extremity Function by Electrical Activation of Paralyzed Muscle. "Open Loop Control in Restoration of Upper Extremity Function", Columbus, OH, September 12, 1983.

Ohio Rehabilitation Association - Medical Options for Rehabilitation in the 80's, Akron, OH, October 26, 1983.

Neuroscience Society Symposium - Application of Neuroscience to Human Prostheses, "Functional Activation of Paralyzed Extremities", Boston, Mass., November 9, 1983.

University of Minnesota, Biotechnology Seminar Series, "Control of the Paralyzed Upper Extremity by Functional Neuromuscular Stimulation", Minneapolis, Minnesota, January, 1984.

International Congress on Functional Electrical Stimulation, Workshop on Functional Electrostimulation Applied to the Restoration of Locomotion for Paraplegic Patients, Montpellier, France, April 2-7, 1984.

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2nd International Conference on Rehabilitation Engineering. Chairman of Special Session on Neural Prosthetics for the Disabled, "Functional Activation of the Paralyzed Extremities" June 19, 1984, Ottawa, Canada.

Spinal Cord Society International Convention, "Computerized Hand Control Stimulation for Quadriplegics", August 24, 1984, Minneapolis, Minnesota.

Technical Reviewer (U.S. designate) - Ljubljana Implantable Peroneal Nerve Stimulator, Ljubljana, Yugoslavia, September, 1984.

American Paraplegia Society, Symposium on Functional Electrical Stimulation, "Overview of the Basics of Functional Electrical Stimulation", Las Vegas, Nevada, September, 1984.

Second International Conference on Surgical Rehabilitation of the Upper Limb in Tetraplegia, "Functional Electrical Stimulation of Muscles in Tetraplegia" and "Electrical Studies of Excursion and Length on Muscles for Transfer", Hyeres (Giens) France, October 10-11, 1984.

Workshop on Neuromuscular Stimulation - Royal College of Surgeons, "Current Work

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Miami Valley Hospital Board of Directors - "Restoring Use of Paralyzed Limbs by Electrical Stimulation", Miami Valley Hospital, Dayton, OH, October 23, 1984.

Fifteenth Neural Prosthesis Workshop, "Functional Neuromuscular Stimulation", National Institute of Health, Bethesda, Md., Nov. 14-16, 1984.

IEEE Engineering in Medicine and Biology (Dallas-Fort Worth Chapter) Functional Electrical Stimulation of Muscles, University of Texas at Arlington, Arlington, Texas, December 3, 1984.

Functional Electrical Stimulation, Conference II, Rehabilitation R&D, Veterans Administration, Washington, DC., January 1985.

University of Alberta, "Functional Activation of Paralyzed Extremities", Edmonton, Ontario, February, 1985.

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Staff Development, Cleveland Metropolitan/Highland View Hospitals, "Maximizing Upper and Lower Extremity Function", Cleveland, OH, December 1985.

Kolff Symposium, International Symposium on Artificial Organs, Biomedical Engineering and Transplantation, "Coordinated Control of Position and Force in Paralyzed Hands With FNS." Salt Lake City, Utah, Jan. 20-23, 1986.

House of Representatives, Statement Before the Committee on Veterans Affairs, Subcommittee on Oversight and Investigations, Washington, D.C., February 19, 1986.

Patterson Lecturer, Hospital for Special Surgery, New York, NY, March 5, 1986.

Applied Neural Control Research Day, Case Western Reserve University "Upper Extremity Assist Systems", Cleveland, OH, May 9, 1986.

Spinal Cord Society Research Conference, Wayzata, Minn, May 15-16, 1986.

Dr. C.E.G. Robinson Lectureship, "Functional Electrical Stimulation - Upper Limbs of the Quadriplegic Person", Vancouver, B.C., July 21-22, 1986.

Canadian Paraplegic Association, 2nd Annual Spinal Cord Injury Research Symposium "Functional Electrical Stimulation to Improve Prehensile Function in Tetraplegics", Hamilton Ontario, October 10, 1986.

Seventeenth Neural Prosthesis Workshop, NIH, Washington, D.C. October 15-17, 1986.

Present Status and Recommendations for Future Activity: Upper Extremity Electrical Function, NIHR Workshop on Electrical Stimulation, Washington, D.C., October 31, 1986.

Biomedical Engineering Colloquia Series, OH State University, Columbus, OH, December 5, 1986.

Participant, Functional Electrical Stimulation Training Task Force, VA Rehabilitation R&D, Washington, D.C., January 12, 1987.

University of Minnesota Biomedical Engineering Seminar, "Current Concepts in Restoration of the Tetraplegic Upper Extremity Using FNS, January 20, 1987.

Rehabilitation Counseling Education Program, "Functional Electrical Stimulation", Kent State University, Kent, OH, March 11, 1987.

Course Director, Eleventh Annual Great Lakes Biomedical Conference, "Current Concepts in Restoration of the Tetraplegic Upper Extremity Using Functional Neuromuscular Stimulation", Racine, Wisconsin, April 24, 1987.

IEEE 20th Videoconference participant, "New Technologies in Biomedical Engineering", Healthcare Information Network, October 27, 1987.

Eighteenth Neural Prosthesis Workshop, Surgical Restoration and FNS in the Tetraplegic and, Washington, DC, October 28-30, 1987.

Euromedecine 87, "Implementation of a Functional Neuromuscular Stimulation Neuroprosthesis for Control of the Tetraplegic Hand", Montpellier, France, November 10-14, 1987.

Functional Electrical Stimulation of Paralyzed Muscles in the Upper Extremity. Spinal Cord Injury Symposium, Cleveland, OH, March 18-19, 1988.

Progress in Engineering Conference, University of Strathclyde, "Upper Extremity Assist Devices for Control of the Tetraplegic Hand", Glasgow, Scotland, September 20-22, 1988.

Functional Electrical Stimulation for Restoration of Upper Extremity Movement. Visiting Professor, Miami Project, Miami, Florida, October 4-6, 1988.

Nineteenth Neural Prosthesis Workshop, Bethesda, Maryland, October 25-28, 1988.

Neurology Grand Rounds, "Neural Prostheses for Motor Control", Royal North Shore Hospital, Spinal Unit, Koorabel, Australia, March 2, 1989.

Upper Extremity Control with Functional Neuromuscular Stimulation, Royal North Shore Hospital, Spinal Unit, Koorabel, Australia, March 2, 1989.

An Overview of the Upper Extremity Hand Grasp System. Fourth Annual Applied Neural Control Research Day, Case Western Reserve University, May 23, 1989.

Statement before the Committee on Veterans Affairs, Subcommittee on Hospitals and Health Care, House of Representatives, Washington, D.C., September 13, 1989.

Motor Prostheses. Twentieth Neural Prosthesis Workshop. Bethesda, MD, October, 1989.

FES: Clinical Research Update. Veterans Administration, Spinal Cord Injury Symposium, Dayton, OH, October 24, 1989.

Functional Electrical Stimulation: Bringing the Center of Excellence to Life: Research and Development Strategy for FES. Northeast OH Biotechnology Association, Cleveland, OH January, 1990.

Department of Veterans Affairs, Rehabilitation Research and Development (Rehab R&D) Service, Spinal Cord Injury Priority Workshop, LaJolla, CA, March 3-7, 1990

Twenty-first Neural Prosthesis Workshop, Bethesda, MD, October, 1990.

Presentation University of Miami, program "Spinal Cord Injury: A team approach to comprehensive management and integrated research, Miami Florida, January 23-27, 1991.

FES Technology Transfer. Applied Neural Control Research Day, Cleveland, OH, May 20, 1991.

Multisite Evaluation of Upper Extremity Motor Prosthesis. Engineering Foundation Conference on Neural Prostheses: Motor Systems III, Banff, Alberta, August, 1991.

The Clinical Application of Rehabilitation Technology: Current Developments in FES. RESNA Midwest Regional Conference, Michigan State University, October 4-5, 1991.

Twenty-second Neural Prosthesis Workshop, Bethesda, MD, October, 1991.

Presentation to the Spinal Cord Research Foundation Board of Trustees, Washington DC, November 15, 1991.

Functional Electrical Stimulation. Neurological Trauma: The Road to Re-Entry, Key Note Speaker Greater Pittsburgh Rehab Hospital, February 27-28, 1992.

Update on current application of FES. Workshop on Functional Electrical Stimulation, Westmead Hospital, Sydney, Australia, March 4, 1992.

FES systems for restoration of grasp in quadriplegia. Austin Hospital, Melbourne, Australia, March 11, 1992.

Rehabilitation Team Approach in SCI: Focus on Upper Extremity Issues. National Rehabilitation Hospital, Washington DC, April 2, 1992.

Grand Rounds, Department of Rehabilitation Medicine, University of Pennsylvania Medical Center, April 28, 1992.

Functional Neuromuscular stimulation for restoration of upper extremity function. OH State University, Biomedical Engineering Department, June 3, 1992.

Neural Prosthetic Concepts for Prosthesis Application. Orthotics and Prosthetics Meeting, Washington, DC, July 22-25, 1992.

Implantable Systems for Control of the Paralyzed Upper Extremity in Spinal Cord Injury. International Symposium on Therapeutic Stimulation, Liverpool, England, August 24-28, 1992.

Restoration of Hand Function in Tetraplegia. Medtronic Bakken Research Center B.V., The Netherlands, September 21, 1992.

FES Research: Clinical Applications. Univ. Karlsruhe, Karlsruhe, Germany, September 22, 1992.

Technology Transfer of an Upper Extremity Neuroprosthesis for Restoration of Hand Function. Keynote Speaker: 4th Vienna International Workshop on Functional Electrostimulation, Vienna Austria, September 24-27, 1992.

FES Technology: Current State of the Art. USC University Hospital, Los Angeles, CA; Alvarado Hospital, San Diego, CA; San Ramon Regional Medical Center, San Ramon, CA, December 7-10, 1992.

Restoration of Functional Control in the Extremities by Electrical Activation of Paralyzed Musculature. Mari Hulman-George Lectures in Neurobiology, Purdue University, West Lafayette, Indiana, February 23, 1993.

Restoration of Hand Control in Spinal Cord Injured Patients, Research Day, Case School of Engineering, Cleveland, OH May 4, 1993.

Peckham PH, Kilgore K.L., Keith MW: Implementation of an Upper Extremity Neural Prosthesis. Applied Neural Control Research Day, May 17-18, 1993.

Seminar: Keith MW, Peckham PH: Surgical and Electronic Reconstruction of Tetraplegia. Lutheran Medical Center, St. Louis, MO June 26, 1993.

Neural Prosthesis Workshop, Bethesda, MD, October 12-15, 1993.

Neural Prostheses for Motor Control. Fifth COST 219 Conference, Tregastel, France, June 7-8, 1994.

Institute for Mechanics and Materials (IMM) and Institute for Biomedical Engineering (IBME) workshop "Biomaterials: Cellular Responses to Implanted Materials", La Jolla, California, September 12-14, 1994.

Neural Prosthesis Workshop, Bethesda, MD, October, 1994.

Assistive Technology Conference, Baltimore, MD, "Enhancing Human Movement in the 21st Century - Internal to External Dimension", April 7-9, 1995.

Neural Prosthesis Workshop, Bethesda, MD, October 1995.

Experiences in the Upper Extremity: Ongoing Multi-Center Clinical Trials and Future Directions. Keynote Speaker: Second International FES Symposium, Sendai, Japan, October 23-26, 1995.

Grand Rounds, Keio University, PM&R Department, Tokyo, Japan, "Control of Grasp and Release in C5 and C6 Spinal Cord Injury with Implantable Functional Electrical Stimulation", October 26, 1995.

Grand Rounds, Rehabilitation Institute of Chicago, January 18, 1996.

FES Transfer Workshop, Shriners Hospital for Crippled Children, Philadelphia, PA, "Results of Multi-Center Trials of Implantable Hand Grasp System", January 27, 1996.

Grand Rounds, MetroHealth Center for Rehabilitation, "Restoration of Functional Grasp in Spinal Cord Injury", Cleveland, OH, February 26, 1996.

American Spinal Injuries Association, poster "Multi-Center Functional Evaluation of a Neuroprosthesis for Hand Control", Seattle, WA, April 22, 1996.

NIH Spinal Cord Injury Workshop "Neural Prostheses for Functional Restoration in Spinal Cord Injury", Bethesda, MD, September 30-October 1, 1996.

27th Neural Prosthesis Workshop, Bethesda, MD, October, 1996.

Edwin Shaw Hospital for Rehabilitation, Issues in Research and Rehabilitation "Neuroprosthetic Applications for Enhancing Functional Independence", Akron, OH, July 12, 1997.

International FES Society Meeting, Vancouver, British Columbia, August, 1997.

28th Neural Prosthesis Workshop, Bethesda, MD, October, 1997.

Department of Veterans Affairs, Rehab R&D National Research and Development Meeting, Overview Rehabilitation R&D Program, Atlanta, GA, October 1997.

Panel Co-Chair: "Rehabilitation and Assistive Technology Panel", NIH Bioengineering Consortium (BECON) "Bioengineering Research: Building the Future of Biology & Medicine", Bethesda, MD, 2/27-28, 1998.

Case Western Reserve University, Minnesota Alumni Chapter, "Neuroprostheses for Functional Restoration", Minneapolis, MN, March 21, 1998.

ASIA Pre-Meeting Course, Restoring Limb and Bladder Function with Electrical Stimulation, "Future Directions - Hand and Arm Movement", Cleveland, OH 4/19/98.

Keynote Speaker: "Functional Electrical Stimulation Neuroprostheses", Scientific Studies on Upper Extremity Reconstruction", Keynote Address to VI International Conference on Surgical Rehabilitation of the Upper Limb in Tetraplegia, Cleveland, OH

5/20-23/98.

Kessler Institute, Emerging Technologies: New Frontiers in Medical Rehabilitation, "Neuroprostheses of Today and Tomorrow", September 25, 1998.

29<sup>th</sup> Neural Prosthesis Workshop, Bethesda, MD, October, 1998.

Peckham PH, Creasey G H: Functional Restoration Employing Electrical Stimulation: Current Status of Clinical Applications and Potential for Multiple Sclerosis. Multiple Sclerosis: A Step Forward Conference, Department of Veterans Affairs, Chandler AZ, February 3-5, 1999.

Peckham PH: Visiting Speaker, University of Kentucky, Restoration of Functional Grasp in Spinal Cord Injury, February 11, 1999.

Edison Biotechnology Center, "Technology Development Through Federal Partnerships: Practical Tips from the Participants", panel discussion "Finding and Forming the Partnerships, including SBIR", Cleveland, OH, March 16, 1999.

Society for Disability Studies Annual Meeting, "FES for Improved Body Functions", Washington, DC, May 28-29, 1999.

NIH Sponsored Workshop, Brain-Computer Interface Technology: Theory and Practice", "An EEG-based Controller for the Hand Grasp Neuroprosthesis", Rensselaerville Institute, New York, 6/16-20/99.

30<sup>th</sup> Neural Prosthesis Workshop, Bethesda, MD, October, 1999.

Peckham PH: Neuroprosthesis for functional restoration. Joint Biomedical Engineering Seminar Series, University of Memphis, March 1, 2000.

Neurology Grand Rounds, University of California, San Diego "Restoration of Upper Extremity Control in Spinal Cord Injury using Functional Neuromuscular Stimulation", April 28, 2000.

Peckham PH: Neural Control of Upper Limb Function. 7<sup>th</sup> Annual Meeting of the American Society of Neurorehabilitation, San Diego, CA, April 27-29, 2000.

Peckham PH: Future Developments in Neuroprosthetics. Spinal Injury: New Horizons Conference, Westminster, United Kingdom, June 2-3, 2000.

Peckham PH: Upper Extremity Neuroprostheses: Lessons Learned from Research through Clinical Trials, Keynote Address to International Functional Electrical Stimulation Society, Aalborg, Denmark, June 18-21, 2000.

Alfred E. Mann Institute for Biomedical Engineering, "State of the Art in Functional Electrical Stimulation (FES) for Reach and Grasp", Putting the Brain in Command, University of Southern California, Los Angeles, CA, July 8, 2000.

Peckham PH: Keynote Lecture, 1<sup>st</sup> Conference of Asia-Pacific Functional Electrical Stimulation Society, Cheju, South Korea, September 21-23, 2000.

Peckham PH, Keynote Research Talk, Bioengineering, NCMRR Advisory Board, 1/3/01.

Peckham PH: Enhancement of Upper Extremity Function in People with Tetraplegia. American Academy of Neurology, Philadelphia, PA, 5/7/01.

Presentation, Royal North Shore Hospital, Upper Extremity Neuroprosthesis, Sydney, Australia, 5/29/01.

Peckham PH: Upper Extremity Neuroprosthesis. Brown University, Providence, RI, 6/3/01

Peckham PH: The Evolution of Neural Prosthesis. "Neuromodulation: Defining the Future". Cleveland Clinic Foundation, Cleveland, OH, June 8-10, 2001.

Peckham PH: Neuroprostheses: Progress in Design for Spinal Cord Injury. Charles Herndon Alumni Society, Cleveland, OH, June 22, 2001.

Peckham PH: Restoring Movement with Neural Prostheses: Bridging Academia, Medicine, and Industry, Whitaker Foundation Biomedical Engineering Annual Conference, LaJolla, CA, 8/10/01.

Peckham PH: Functional Gains with the FreeHand System. University of Kentucky, Clinical Advances in NeuroRehabilitation Science Conference, Lexington, Kentucky, 9/27-29/01

Peckham PH: Restoring Movement with Neural Prostheses: Bridging Academia, Medicine, and Industry. Boston University, Distinguished Science and Chairs in Biomedical Engineering Seminar Series, 11/6-7/01.

Peckham PH: Biomedical Engineering Education Related to Rehabilitation, NCMRR Advisory Board, 12/4/01.

Peckham PH: Bioengineering and Assistive Devices, Keynote Address to NCMRR Training Workshop, NIH, 12/4/01.

Peckham PH: Mock Study Section Panel, NCMRR Training Workshop, NIH, 12/4/01.

Peckham PH: Neural Prosthesis and Electrical Stimulation. Case Western Reserve University, MST Program, Cleveland, OH, 2/13/02.

Peckham PH: Mentorship: Developing Physiatrists into Independent Investigators, Perspectives of a Biomedical Engineer, Association of Academic Physiatrists Annual Meeting, Las Vegas, NV, 2/28/02.

Peckham PH: Re-Engineering the Paralyzed Nervous System, National Academy of Engineering, 7<sup>th</sup> Symposium on Frontiers of Engineering, Irvine, CA, 3/1-3/02.

Peckham PH: Restoring upper extremity function with neuroprosthesis, IGERT Seminar Series, Arizona State University, 3/21/02.

Peckham PH: Development of Networked Implantable Neuroprostheses. Bioengineering Research Partnership Grantee Presentation, NIH, Bethesda, MD, 3/25/02.

Peckham PH: Outcomes Research After Stroke. Discussant, International Stroke Symposium, Kansas City, Kansas, 4/26-28/02.

Peckham PH: New Tools in Rehabilitation: Restoring Function Using Electrical Stimulation. Case Western Reserve University, Mini-Medical School, 4/24/02.

Peckham PH: STEP NIH Cyberscience Meeting: Biomedical Applications of Human-Machine Interfaces, Bethesda, MD, 5/30/02.

Peckham PH: "Upper Extremity Neuroprosthesis". Brown University, Providence, Rhode Island, September 30, 2002

Peckham PH: "Building a Program in Rehabilitation Research: A Case Study". American Congress of Rehabilitation Medicine Satellite Symposium, Philadelphia, PA, 10/3/02

Peckham PH: BRP presentation, Neural Prosthesis Workshop, 10/16-18/02.

Peckham PH: "Restoring Upper Extremity Function with Neuroprostheses", Cornell University, Ithaca, NY, 11/12/02.

Peckham PH: "Neuroprostheses for Restoration of Motor Function", Clifford E. Brubaker Keynote Lecture, University of Pittsburgh, 4/10/03.

Peckham PH: "Functional Electrical Stimulation". Current Topics in Orthopaedic Traumatology, MetroHealth Medical Center, 5/16/03.

Panelist, BECON Bioengineering Consortium's Sixth Annual Symposium, NIH, "Team Science in Neuroprosthesis Development" Bethesda, MD, 6/23-24/03

Peckham PH: "Development of Networked Implantable Neuroprostheses". 3<sup>rd</sup> Annual BRP Grantee Meeting, Bethesda, MD, 6/25/03.

Peckham PH: "Re-engineering the Paralyzed Nervous System". Junior Medical Camp Alumni Day, Case Western Reserve University, 8/13/03.

Peckham PH: "Networked Neural Prosthesis", Neural Prosthesis Workshop, 10/21-23/03

Peckham: "Restoring Upper Extremity Function with Neuroprostheses". IGERT Seminar Series, Case Western Reserve University, Cleveland, OH, 11/24/03.

Peckham: "Neuroprostheses for Functional Restoration: Current Status and Future Directions". Featured Speaker, International Society for Neural Regeneration, Pacific Grove, CA, 12/10-13/03.

Peckham: "Functional Gains with Upper Extremity Neuroprostheses". Restoration of Wheeled Mobility Conference, Amsterdam, 4/17-21/04

Peckham PH: "Development of Networked Implantable Neuroprostheses". 4<sup>th</sup> Annual BRP Grantee Meeting, Bethesda, MD, 7/29-30/04.

Peckham PH: "Electrodes for Functional Electrical Stimulation: Design and Performance", Materials & Processes for Medical Devices Conference, St. Paul,

Minnesota, August 25-27, 2004.

Peckham PH: "FES Applications for Rehabilitation". The National Rehabilitation Awareness Week, MetroHealth Medical Center, Cleveland, OH, 9/22/04.

Peckham PH: "Moving after Paralysis", All-Star Symposium (also session organizer), Case Western Reserve University, October 4, 2004.

Peckham PH: "Paralysis: Natural Recovery vs. Assistive Technology". White House/ Department of Veterans Affairs Conference: "Emerging Technologies in Support of the New Freedom Initiative - Promoting Opportunities for People with Disabilities", Washington DC, October 13-14, 2004.

Peckham PH: "Cleveland FES Center- Facilitating Growth in a VA Center of Excellence", VA Rehabilitation Research and Development Centers Directors Meeting, (also meeting co-chairman), Cleveland, OH, October 19-20, 2004.

Peckham PH: "Neuroprostheses for Restoration of Movement", Inaugural Medtronic Lecture, Department of Biomedical Engineering, Johns Hopkins University, Baltimore, MD, November 11, 2004.

Peckham, PH:, "Research and Development Needs for Neural Interfaces", Neural Interfaces Conference, NIH 11/04

Peckham PH: Cleveland FES Center presentation, VA Center Directors Meeting, Bronx, New York, 12/9-10/04

Peckham, PH: "Neuroprosthetic therapies for SCI", 31<sup>st</sup> Annual Northeast bioengineering conference, Stevens Institute, Hoboken, NJ, April 2, 2005.

Peckham PH: "Upper Extremity FES Program", ShowCASE, Case Western Reserve University, Cleveland, OH, April 6, 2005.

Peckham, PH: "Functional Neuromuscular Stimulation", State of the Science Workshop: Research to Clinical Practice for Spinal Cord Injury, Walter Reed Army Medical Center, May 27, 2005.

Peckham PH: Cleveland FES Center presentation, VA Center Directors Meeting, Palo Alto, CA, October 24-25, 2005.

Peckham PH, Thrope GB: Functional Electrical Stimulation and Neural Prosthesis. MEDI2005, Hartford, Connecticut, October 25-26, 2005.

Peckham PH: Functional Electrical Stimulation. Presentation to the NICHD Council, Washington, DC, January 26, 2006.

Peckham PH: Restoration of Movement in Paralysis, AAAS Annual Meeting "Smart Prosthetics", San Francisco, February 2007.

Peckham PH: Advances in Smart Prosthetics: Where Are they Taking Us? The Presidents' Circle of the National Academies, Woods Hole, MA, June 10-12, 2007.

Peckham PH: Upper and Lower Extremity Neuroprostheses. IEEE International Biomedical Circuits and systems conference (BIOCAS2007), Montreal, Canada November 28, 2007.

Peckham PH: Neuroprostheses for restoration of motor function. Department of Neurosciences Seminar, Case Western Reserve University, January 31, 2008.

Peckham PH: Brain Neuroprosthesis Interface. Future of Neuroscience Conference: Neural Repair, American Academy of Neurology Annual Meeting, Chicago, IL April 17-18, 2008.

Peckham PH: Neuroprostheses for Movement Restoration, Keynote Speaker, Adaptive Motion of Animals and Machines, Case Western Reserve University, Cleveland, OH, June 1-6, 2008.

Peckham PH: Panelist: Frontiers of Healthcare Conference: Neurotechnology: From the Lab to Everyday Life, Brown University, Providence, RI, June 9, 2008.

Peckham PH: Panel Discussion Moderator, Neural Interfaces Workshop, Cleveland, OH, June 16-29, 2008

Peckham PH: Faculty Spotlight Series, Case Western Reserve University, March 5, 2009.

Peckham PH: Case School of Engineering Seminar, March 20, 2009.

Peckham PH: Department of Defense, Stakeholders Meeting, Washington, DC, March 25-26, 2009

Peckham PH: No Barriers Symposium, "Neuroprostheses for Movement Restoration", Miami, FL, June 5-6, 2009

Peckham PH: American Paraplegia Society Meeting, Munro Lecture "Neuroprostheses for Movement Restoration", Dallas, TX, September 24-26, 2009.

Peckham PH: Restoring Movement after Paralysis. Estate Planning Advisory Council, Case Western Reserve University, October 15, 2009.

Peckham PH: North American Neuromodulation Annual Meeting. New Technologies and Frontiers. Functional Electrical Stimulation, December 3-5, 2009.

Peckham PH: Panel Moderator: “The Medtronic Leadership in Biomedical Engineering Panel”, 2010 Midwest Biomedical Engineering Career Conference, Case Western Reserve University. March 5, 2010.

Peckham PH: Moderator, Grand Challenges Forum, “Repairing or Reversing Damage to the Nervous System”, IEEE/EMBS Forums, Washington, DC, May 6-8, 2010

Peckham PH: Pre-Conference Course “FES Applications for Spinal Cord Injury”, Contemporary Forums for SCI, Boston, MA, May 12, 2010.

Peckham PH: “An Overview of Implantable FES Devices”, Contemporary Forums for SCI, Boston, MA, May 12, 2010.

Peckham PH: Moderator, “Special Session: Future of NIC”, Neural Interfaces Workshop, Long Beach, CA, June 21-23, 2010 *Moderator: Hunter Peckham*

Peckham PH: Science Perspectives – Invited Expert on Neurologic Devices Research and Development, 2010 ASK Children Workshop, September 13, 2010.

Peckham PH: Cognitive Neural Prosthesis, NANS, Las Vegas, NV, December 3, 2010

Peckham PH: Neuroprostheses for Movement Restoration, Distinguished Lecture Series, University of Toronto, Feb. 15, 2011.

Peckham PH: Engineering Solutions to Chronic Disease. AIMBE Annual Meeting, Washington, DC February 21, 2011.

Peckham PH: Electronic Stimulation After SCI: Strategies for Restoration of Movement. NNS Conference, Fort Lauderdale, FL, July 13, 2011

### **Conference Presentations/Abstracts**

Peckham PH, Mortimer JT, Reswick JB, Shealy CN: Electrochemical Properties of Electrode Materials for Biological Stimulation. Proceedings for the 20th Annual Conference on Engineering in Medical and Biology, November, 1967.

Peckham PH, Romich BA, Reswick JB: Sequential Electrical Stimulation of Skeletal Muscle. Proceedings of the 8th International Conference on Medical and Biological Engineering, July, 1969.

Peckham PH, and Mortimer JT: Fatigue Characteristics of Electrically Stimulated Skeletal Muscle. Proceedings of the 55th Annual FASEB Meeting, April, 1971.

Crago PE, Peckham PH, Van Der Meulen JP, Mortimer JT: Minimization of Charge Transfer and Energy Dissipation During Electrical Stimulation. Biomedical Engineering Society, Baltimore, Maryland, April, 1972.

Peckham PH, Mortimer JT, Van Der Meulen JP: Reversal of Fiber Types in Cat Skeletal Muscle Following Chronic Electrical Stimulation. Presented to the Biomedical Engineering Society, Baltimore, Maryland, April, 1972.

Peckham PH, Marsolais E., Mortimer JT: Intramuscular Stimulation: Applications to Upper Extremity Orthotics. Presented at the 4th Annual Biomedical Engineering Society Meeting, Los Angeles, California, 1973.

Peckham PH, Marsolais EB, Mortimer JT: Electrical Stimulation of Hand Muscles in Quadriplegic Man. Proceedings of the FASEB Meeting, Atlantic City, New Jersey, April, 1974.

Peckham PH: Proportional Control of Upper Extremity Orthoses for the Quadriplegic. Proceedings of the 27th ACEMB Conference, October, 1974.

Peckham PH, Jablonski EF, Ko WH: An RF Powered Implantable Multichannel Stimulator. 28th Annual Conference on Engineering in Medicine and Biology, New Orleans, Louisiana, Vol. 17, p. 100, September, 1975.

Peckham PH, Mortimer JT, Marsolais EB: Strong Fatigue-Resistant Contractions Induced Electrically in Paralyzed Muscle for Functional Use. Presented at 21st Annual Meeting of the Orthopaedic Research Society, San Francisco, California, February, 1975.

Peckham PH: Control of Contraction Strength of Electrically Stimulated Muscle by Pulse Width and Frequency Modulation. Presented at the 29th Annual Conference on Engineering in Medicine and Biology, Boston, Massachusetts, Vol. 18, p. 118, November, 1976.

Poon CW, Ko WH, Peckham PH: An Implantable RF Powered Dual Channel Stimulator. Proceedings of the 29th Annual Conference on Engineering in Medicine and Biology, Boston, Massachusetts, Vol. 18, p. 118, November, 1976.

Rosen J.J., Peckham PH, Jablonski EF, Riley T: Biomaterials in the Encapsulation of an Implantable Stimulator. Proceedings of the 30th Annual Conference on Engineering in Medicine and Biology, Los Angeles, California, Vol. 19, p. 123, November, 1977.

Peckham PH, Marsolais EB, Mortimer JT: Restoration of Key Grip and Release in the C6 Quadriplegic Through Functional Electrical Stimulation. Abstracts of the 34th Annual Meeting of the American Society for Surgery of the Hand, Paper 35, 1979.

Peckham PH, Freehafer AA, Strother RB, and Thrope GB: Restoration of Key Grip and Release in the C5 - C6 Tetraplegic Through Functional Electrical Stimulation. Proceedings of the International Conference on Rehabilitation Engineering, 227-229, Toronto, 1980.

Buckett JR, Peckham PH, and Strother RB: Shoulder Position Control, An Alternative Control Technique for Motion Impaired Individuals. International Conference on Rehabilitation Engineering, 244-247, Toronto, 1980.

Peckham PH: Restoration of Upper Extremity Control in the High Level Quadriplegic by Functional Electrical Stimulation. American Society of Mechanical Engineering, Chicago, November, 1980.

Peckham PH, Freehafer AA, Keith MW: Electrical Stimulation of Muscle - A Technique for Intra-operative Assessment of Excursion During Tendon Transfer Surgery. 36th Annual Meeting American Society for Surgery of the Hand, Las Vegas, February, 1981.

Peckham PH, Thrope GB, Strother RB, Buckett J.B., Freehafer AA, Keith MW: Functional Neuromuscular Stimulation Systems for Control of the Hand in the Quadriplegic. Proceedings of the 4th Annual Conference on Rehabilitation Engineering, p. 209-211, Washington, D.C., August, 1981.

Peckham PH, Thrope GB, Marsolais EB: Percutaneous Intramuscular Excitation of Paralyzed Skeletal Muscle: Electrode Reliability. Proceedings of the 4th Annual Conference on Rehabilitation Engineering, p. 229-231, Washington, D.C., August, 1981.

Freehafer AA, Peckham PH, Keith MW: The Contribution of the Rehabilitation Engineer in Tendon Transfer Surgery. Proceedings of the 4th Annual Conference on Rehabilitation Engineering, p. 212-213, Washington, D.C., August, 1981.

Thrope GB, Peckham PH, Crago P.E.: A Computer Controller Multichannel Stimulator for Laboratory Use in Functional Neuromuscular Stimulation. Proceedings of the 4th Annual Conference on Rehabilitation Engineering, p. 220-222, Washington, D.C., August, 1981.

Strother RB, Buckett JR, Peckham PH: A Functional Neuromuscular Stimulation System for Control of Grasp and Release. Proceedings of the 4th Annual Conference on Rehabilitation Engineering, p. 223-225, Washington, D.C., August, 1981.

Peckham PH, Thrope GB, Buckett JR, Freehafer AA, Keith MW: Coordinated Two Mode Grasp in the Quadriplegic Initiated by Functional Neuromuscular Stimulation. Proceedings of the IFAC Symposium on Control Aspects of Prosthetics and Orthotics, paper 1.5, Columbus, OH, May, 1982.

Peckham PH, Thrope GB, Buckett JR, Freehafer AA, Keith MW, Bloom E.: Clinical Implementation of a Neuroprosthetic Hand Assist System in the Quadriplegic. Proceedings of the 5th Annual Conference on Rehabilitation Engineering, p. 58, August, 1982.

Peckham PH, Freehafer AA, Keith MW: Restoration of Hand Function in the High Level Quadriplegic by Functional Neuromuscular Stimulation. 38th Annual Meeting of the American Society for Surgery of the Hand, March, 1983.

Lacey SH, Wilbur RG, Freehafer AA, Peckham PH: The Deltoid to Triceps Transfer - A Clinical and Biomechanical Assessment. 38th Annual Meeting of the American Society for Surgery of the Hand, March, 1983.

Thrope GB, Peckham PH, Crago P.E., Braswell S.D., and Buckett JR: Linearization of an Open Loop Functional Neuromuscular Stimulation System Through a Piecewise Linear Approximation. 6th Annual Conference on Rehabilitation Engineering, 66-68, June, 1983.

Buckett JR, Braswell S.D., Thrope GB, and Peckham PH: A Microprocessor Based Portable Functional Electrical Stimulation System. 6th Annual Conference on Rehabilitation Engineering, 72-74, June, 1983.

Marsolais EB, Kobetic R., Cochoff S.F., and Peckham PH: Reciprocal Walking in

Paraplegic Patients Using Internal Functional Electrical Stimulation. 6th Annual Conference on Rehabilitation Engineering, 78-80, June, 1983.

Gallaher K.A., Peckham PH, and Thrope GB: Characterization of Coordinated Hand Movement in FNS. 36th ACEMB, 41, September, 1983.

Johnson M.W., Peckham PH, and Thrope GB: Flexible Software Controller Algorithm for the Quadriplegic. 36th ACEMB, 96, September, 1983.

Smith B., Braswell S.D., Buckett JR, Jackson K.C., Peckham PH: A Portable Microprocessor Controller Implantable Functional Neuromuscular Stimulation System. Proceedings of the 2nd International Conference on Rehabilitation Engineering, 531-532, June, 1984.

Gallaher K.A., Peckham PH, and Thrope GB: Characterization and Linearization of Open Loop Hand Control Using Functional Neuromuscular Stimulation. Proceedings of the 2nd International Conference on Rehabilitation Engineering, 541-542, June, 1984.

Peckham PH, Crago P.E., Riso R.R.: Functional Activation of the Paralyzed Extremities. Proceedings of the 2nd International Conference on Rehabilitation Engineering, 54-55, June, 1984.

Keith MW, Peckham PH, Freehafer AA, Thrope GB, Gordon R.E., Sobel: Implementation of a Functional Neuromuscular Stimulation System for a Tetraplegic Upper Extremity. American Spinal Cord Injury Association Annual Meeting, Atlanta, Georgia, April 1985.

Thrope GB, Peckham PH, Buckett JR, Keith MW, Freehafer AA: A Total System Approach to Implementing a Functional Neuromuscular Stimulation Motor System Neuroprostheses. International Medical Society of Paraplegia Annual Conference, Edinburg, Scotland, September, 1985.

Buckett JR, Braswell S., Peckham PH, Thrope GB, Keith MW: A Portable Functional Neuromuscular Stimulation System. IEEE/EMBS Symposium, Chicago, Illinois, September, 1985.

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