

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

3361 East Monmouth Road  
Cleveland Heights, OH 44118

### **PERSONAL**

Born: June 23, 1944, Elmira, New York  
Married: Sara Goostrey - 1966  
Children: Two

### **EDUCATION**

Ph.D. - Biomedical Engineering, Case Western Reserve University - 1972  
M.S. - Engineering, Case Institute of Technology - 1968  
B.S. - Mechanical Engineering, Clarkson College of Technology - 1966

### **HONORS AND AWARDS**

Pi Tau Sigma - Honorary Mechanical Engineering Society  
Honorary Member - American Spinal Injury Association (ASIA)  
Research Award - Association of Independent Colleges and Universities of OH  
Fellow - American Institute of Medical and Biological Engineering (AIMBE) - Jan. 1, 1994  
Special Recognition, Pioneer of the Neuroprosthesis, State of Ohio Assembly, House of  
Representatives of the 122<sup>nd</sup> General Assembly of Ohio, 1997  
US Dept. Health and Human Services, Public Health Service, NIH/NICHHD, National  
Advisory Board on Medical Rehabilitation Research Service Award, 9/1/93-6/30/97  
Enterprise Development Inc., Innovation Award, 4/98  
FDA Commissioner's Special Citation - 5/98  
RESNA Leadership Award 6/98  
Northern Ohio Live, Award of Achievement in Science and Technology, 9/98  
Engineer of the Year, Design News, 3/00  
Paul Magnuson Award, VA Rehabilitation Research & Development Service "In  
Recognition of Outstanding Rehabilitation Research Dedicated to Seeking New  
Knowledge to Benefit the Nation's Veterans", 4/01  
State of New South Wales, Australia, Citation for Extraordinary Contribution in the area of  
functional electrical stimulation, 5/01  
Prime Minister of Australia, Letter of Appreciation, 5/01  
Member of the National Academy of Engineering, 2002

### **PROFESSIONAL SOCIETIES**

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

**PROFESSIONAL INTEREST**

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

**RESEARCH AND/OR PROFESSIONAL EXPERIENCE**

- 1996 - present            Director of Orthopaedic Research, Member Bioscientific Staff  
MetroHealth Medical Center
  
- 1993 – present            Member, Board of Directors, NeuroControl Corporation
  
- 1990 - present            Director, Center of Excellence in FES  
Cleveland VA Medical Center
  
- 1989 - 1990              Interim Director, Center of Excellence in FES  
Cleveland VA Medical Center
  
- 1988 - present            Professor of Biomedical Engineering  
Case Western Reserve University, Cleveland, OH
  
- 1988 - present            Professor of Biomedical Engineering in Orthopaedics  
Case Western Reserve University, Cleveland, OH  
  
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  
  
Assistant Professor of Biomedical Engineering in Orthopaedics  
CWRU, Cleveland, OH
  
- 1976 - Present            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

**RESEARCH**

***COMPLETED:***

## **NATIONAL INSTITUTES OF HEALTH**

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

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

Principal Investigator - Microelectronics Laboratory for Biomedical Sciences. (W.H. Ko 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 (J.T. Mortimer, 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 (Dr. M.R. Neuman, 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 (Dr. M.R. Neuman, 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.

## **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.

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.

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

Co-Director - Rehabilitation Engineering Center for Control of Mobility and Environment. (C.H. Herndon - 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.

## **INVACARE**

Principal Investigator - Development of a Microprocessor Based Wheelchair Controller. Invacare Corporation, 1981-1983.

## **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.

## **EDISON BIOTECHNOLOGY**

Project Director - Multichannel Implantable System for Neural Control, Edison Biotechnology Center,

1990-1991.

**FOOD AND DRUG ADMINISTRATION**

Principal Investigator - Implantable Systems for Restoration of Hand Function. FDA Grant #FD-000832-01, 9/30/92-9/30/96.

## ***CURRENT:***

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

(Awarded: Principal Investigator - Center of Excellence in Functional Electrical Stimulation. Department of Veterans Affairs, 10/02-9/06)

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

Senior Research Career Scientist Award – Department of Veterans Affairs, salary only, 4/1/00 – 3/31/07

Principal Investigator - Multichannel Implantable System for Neural Control, National Institute of Health, 2R01 NS29549, 4/99-03.

Principal Investigator - An EEG-based Controller for FNS Hand Grasp Systems, Ron Shapiro Foundation, 1/00 – 12/02

Principal Investigator - Development of Networked Implantable Neuroprosthesis, NIH, BRP, 9/01 – 5/06

## **COMMITTEES**

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 (IRB), 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 - present. 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-present

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, Sept. 93-May 94

Executive Committee, School of Engineering, Sept. 94-May 95

Advisory Board, The Case Engineering Support Group, 1994 - present

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 (GCRC) Advisory Committee, 6/99 –

Faculty Council, School of Medicine, 1998-2001

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

Case School of Engineering, Appointments Committee, 5/00 –

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

### **SEARCH COMMITTEE**

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

### **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.: 09/009,574, 12/19/2000

Functional Neuromuscular Stimulation System File No.: 9375.17219-DIV CON 2, NeuroControl Corp., Serial No.: 09/694,380, Filing Date: 10/23/2000, pending

Functional Neuromuscular Stimulation System, File No.: 9375.17219-DIV CON 2, NeuroControl Corporation, Serial No.: 09/726,146, Filing Date: 11/29/2000, Pending

### **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, BMES98 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 5/11/99; Bronx, NY 5/14/99; West Haven, Conn. 5/17/99.

Repair and Plasticity Planning Panel, NIH/NINDS, 2/18/00

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

Moderator, International Functional Electrical Stimulation Society meeting (IFESS 2001), Envisioning a New Century of Breakthroughs. Special Session: Neural Repair and Functional Restoration Workshop – Bridging the Gap, 6/17-20/01.

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

Peckham PH: Training and Curriculum Development, NCMRR Advisory Board, Bethesda, MD, 12/4/01.

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

### **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 - present

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

National Institute of Child Health and Human Development Council, Liaison from National Advisory Board for the National Center on Medical and Rehabilitation Research (NCMRR), 4/96-4/97.

Research Committee, American Spinal Injury Association, 1995 - present

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

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

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

Kessler, KMRREC Rehabilitation Engineering Emphasis, Advisory, 5/15/00

Site Visitor, Murdock Charitable Trust, merger between Oregon Health Sciences University and Oregon Graduate Institute, 1/9/01.

Kessler, KMRREC Rehabilitation Engineering Emphasis, Advisory, 8/1-2/01

Center for Neural Communication Technology Advisory Board, University of Michigan, (sponsor – NIH National Center for Research Resources), 11/7/02 -

University of Florida, Brooks Center for Rehabilitation Studies, New Lab Advisory, 1/13-15/02.

### **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.

Rehabilitation Research Associated Health Predoctoral Fellowship Program, Department of Veterans Affairs, 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

### **Editorial**

Editorial Board, Paraplegia, August, 1991 - present

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

Reviewer for IEEE/BME, IEEE/TRE, Annals of Biomedical Engineering and Physics, Medical and Biological Engineering, Journal of Spinal Cord Medicine

Journal of the International Federation for Medical & Biological Engineering

Editorial Board, Regenerative Medicine, 1999 –

Editorial Board, Journal Rehab Research & Development, 1999-

### **GRADUATE STUDENTS/FELLOWS**

| <b>M.S.</b>   |   | <u>Date<br/>Graduated</u>                |
|---|---|--|
| Sharon Kromhaut<br>Richard Steinman<br>Donald Bittner<br>Anita Tenteris<br>Karen Gallaher | Tissue Response Around a Stimulated Electrode<br>Characterization and Linearization of Thumb Force<br>and Position with Functional Neuromuscular Stimulation<br>in Tetraplegics | 12/85<br>5/86<br>1/87<br>5/87            |
| Laurie Mendelson<br>Lorie Miller<br>Kevin Kilgore   | Force Vector Recruitment of Electrically Stimulated<br>Paralyzed Thenar Muscles with Application to Functional<br>Neuromuscular Stimulation                                     | 5/87                                     |
| Mark Johnson  | Evaluation of the Use of Shoulder Movement as a<br>Command Control Source.  | 8/87                                     |
| Ronald Hart   | Evaluation of the Selspot II Three-Dimensional Tracking<br>System as a Means of Tracking Upper Extremity<br>Kinematics  | 12/87                                    |
| Anthony Ignagni   | Usage Monitoring in an Upper Extremity Neuroprosthetic<br>Stimulation System  | 8/89                                     |
| William Memberg   | The Design and Evaluation of a Surgically-Implanted<br>Intramuscular Electrode for use with an Implantable<br>Neuromuscular Stimulator  | 5/89                                     |
| Scott Banks   | Performance Evaluation and Failure Analysis of an<br>Implantable Neuromuscular Stimulation System   | 5/88                                     |
| Zhengnian Tang  | An Implantable Multichannel Biotelemeter for Electro-<br>myographic Data Acquisition  | 1/91                                     |
| Julie Hollander   | Integration of Functional Neuromuscular Stimulation<br>Control of Elbow Extension and Hand Grasp  | 5/93                                     |
| Anthony Barrancotta<br>June Akers   | Tissue Response to Chronically Stimulated Implanted<br>Epimysial and Intramuscular Electrodes.  | 6/94<br>6/94                             |
| Rich Lauer  | Control of the Finger Intrinsic Muscles Using Functional<br>Electrical Stimulation  | 7/97                                     |
| Niloy Bhadra<br>Thomas Wolfe  | Implementation of an Implantable Joint Angle Transducer<br>Recording and Mapping of Control Signals for a<br>Bilateral Neuroprosthetic Device                                   | 12/99                                    |
| Avi Gopstein<br>Charisma Kumar<br>Alexis Kuncel   |   | current<br>current<br>current<br>current |

**Ph.D.**

|                |  |      |
|----------------|--|------|
| Kevin Kilgore  | Optimization and Automation of Stimulus Map Synthesis<br>for Upper Extremity FNS         | 8/91 |
| Mark Johnson   |  | 4/94 |
| Zhengnian Tang | A Multichannel Implantable Stimulation and Telemetry<br>System for Neuromuscular Control | 1/97 |

|               |   |         |
|---------------|---|---------|
| Rich Lauer    | A Biopotential Interface for the Control of Neuroprostheses | 5/01    |
| Niloy Bhadra  |   | current |
| Jayme Knutson |   | current |

**Post Doctoral Fellows**

|                          |                        |
|--------------------------|------------------------|
| Karl Mauritz, M.D.       | Niloy Bhadra, M.D.     |
| Graham Creasey, M.D.     | Francois Bethoux, M.D. |
| Clayton Van Doren, Ph.D. | Ken Kondo, M.D.        |
| Peter Gorman, M.D.       | John Chae, M.D.        |
| Carl Billian, M.D.       | Tim Scott, Ph.D.       |
| Soheyl Pourmehdi, Ph.D.  |                        |
| Younghee Lee, M.D.       |                        |

**Advisory/Examination Committee:**

Anamaria Acosta, M.S. & Ph.D.  
 Pedro Acosta, M.S.  
 Margaret Adamczyk, M.S. & Ph.D.  
 Arthur Au, M.S.  
 Kathleen Bailey, M.S.  
 Michael Benser, M.S.  
 Alojz Berec, M.S.  
 Norendra Bhadra, M.S.  
 John Burelbach, M.S.  
 Randy Carter, M.S. & Ph.D.  
 Greg Chapman, M.S.  
 Steve Cochoff, M.S.  
 Avi Cohen, M.S.  
 Joseph Corey, M.S.  
 Ali Estaki, Ph.D.  
 Pierre Grandjean, M.S.  
 Joseph Hanna  
 Mike Hayes, M.S.  
 Anne Hines, M.S. & Ph.D.  
 John Holic, M.S.  
 Kim Holmes, M.S.  
 Lynn Javorsky, M.S.  
 Mohamad Kasti  
 Jayme Knutson, M.S.  
 Ning Lan, M.S. & Ph.D.  
 Michel LeMay, M.S. & Ph.D.  
 Chou Ching Lin, M.S. & Ph.D.  
 Jim Martau, M.S.  
 William McFarland, M.S.  
 Lisa Menia, M.S.  
 Andreas Meyer, M.S.  
 Josh Moss, B.S.  
 Megan Moynahan, M.S.  
 Karen Milchus, M.S.  
 Liz Perletz, M.S. & Ph.D.  
 Eric Perreault, Ph.D.  
 Chris Poletto, M.S. & Ph.D.

Michelle Poulnot , M.S.  
Liz Powell, M.S.  
Kathy Rutherford, M.S.  
Avram Scheiner, M.S.  
John Schild, M.S.  
Nirev Sheth, M.S.  
Jim Sweeney, M.S. & Ph.D.  
Krista Tills-Cabrera, M.S.  
Jim Uhlir, M.S.  
Matt Usey, M.S.  
Chris Vandenhoeert, M.S. & Ph.D.  
Maria Walker, M.S.  
Wendy Wilson, M.S.  
Christanne Wijman

### **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

### **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 P.E., 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.

Freehafer AA, Kelly C.M., Peckham PH: Tendon transfer for restoration of upper limb function after a cervical spinal cord injury. J. Hand Surg 9A(6):887-893, 1984.

Thrope GB, Peckham PH, Crago P.E.: A computer controlled multichannel stimulation system for laboratory use in functional neuromuscular stimulation. IEEE Trans. Biomed. Eng. BME 32(6):363-371, June 1985.

Kelly C.M., Freehafer AA, Peckham PH, Stroh K.: Postoperative results of opponensplasty and flexor tendon transfer in patients with spinal cord injuries. J. Hand Surg. 10-A(6)(I):890-894, Nov. 1985.

Lacey S.H., Wilber R.G., Peckham PH, Freehafer AA: The posterior deltoid to triceps transfer: a clinical and biomechanical assessment. J. Hand Surg. 11A(4):542-547, July, 1986.

Peckham PH: Functional Electrical Stimulation: Current status and future prospects of applications to the neuromuscular system in spinal cord injury. Paraplegia (Silver Jubilee Issue) 25(3):279-288, 1987.

Smith B., Peckham PH, Roscoe D.D., Keith MW: An externally powered, multichannel implantable stimulator for versatile control of paralyzed muscle. IEEE Trans. Biomed. Eng., BME-34(7):499-508, July 1987.

Peckham PH, Keith MW, Freehafer AA: Current concepts review: restoration of functional control by electrical stimulation in the upper extremity of the quadriplegic patient. J Bone Joint Surg 70A(1):144-148, 1988.

Freehafer AA, Peckham PH, Keith M.W., Mendelson L.S.: The brachioradialis: anatomy, properties, and value for tendon transfer in the tetraplegic. J Hand Surg 13A(1):99-104, January 1988.

Keith MW, Peckham PH, Thrope GB, Buckett JR, Stroh K.C., Menger V.: Functional neuromuscular stimulation neuroprostheses for the tetraplegic hand. Clin Ortho & Related Res 233:25-33, August 1988.

Buckett JR, Peckham PH, Thrope GB, Braswell S.D., Keith MW: A flexible, portable functional neuromuscular stimulation neuroprosthetic system. IEEE Trans. Biomed. Eng. 35(11):897-904, November 1988.

Mendelson L.S., Peckham PH, Freehafer AA, Keith MW: Intraoperative assessment of wrist extensor muscle force. J Hand Surg (13A):832-836, November 1988.

Mendelson L.S., Peckham PH, Freehafer AA, Keith MW: Assessment of tendon transfer surgery in the tetraplegic upper extremity. Innov. Tech Biol. Med. 9:281-293, France, 1988.

Keith MW, Peckham PH, Thrope GB, Stroh K.C., Smith B., Buckett JR, Kilgore K.L., Jatich J.W.: Implantable functional neuromuscular stimulation in the tetraplegic hand. J Hand Surg 14A(3):524-530, 1989.

Kilgore K.L., Peckham PH, Thrope GB, Keith MW: Synthesis of hand movement using functional neuromuscular stimulation. IEEE Trans. Biomed. Eng. 36(7):761-770, 1989.

Miller L.J., Peckham PH, Keith MW: Elbow extension in the c5 quadriplegic using functional neuromuscular stimulation. IEEE Trans. Biomed. Eng. 36(7):771-780, 1989.

Kilgore K., Peckham PH, Keith MW: Electrode characterization for functional application to upper extremity FNS. IEEE Trans. Biomed. Eng. 37(1):12-21, 1990.

Wijman C.A., Stroh K.C., Van Doren C.L., Thrope GB, Peckham PH, Keith MW: Functional evaluation of quadriplegic patients using a hand neuroprosthesis. Arch Phys Med Rehabil 71:1053-1057, 1990.

Johnson M.W., Peckham PH: Evaluation of shoulder movement as a command control source. IEEE Trans. Biomed. Eng. 37(9):876-885, 1990.

Letchipia J.E., Peckham PH, Gazdik M., Smith B.: In-line lead connector for use with implanted neuroprosthesis. IEEE Trans. Biomed. Eng., 38(7):707-709, 1991.

Gorman P.H., Peckham PH: Upper extremity functional neuromuscular stimulation. J. Neuro. Rehab. 5:3-11, 1991.

Peckham PH, Creasey G.H.: Neural Prostheses: Clinical applications of functional electrical stimulation in spinal cord injury. Paraplegia 30(2):96-101, 1992.

Betz R.R., Mulcahey M.J., Smith B.T., Triolo R.J., Weiss A.A., Moynahan M., Keith MW, Peckham PH: Bipolar latissimus dorsi transposition and functional neuromuscular stimulation to restore elbow

flexion in an individual with c4 quadriplegia and c5 denervation. J. Amer. Paraplegia Soc. 15:220-228, 1992.

Peckham PH: Opportunities and challenges for the clinical utilization of functional electrical stimulation. Assistive Technology 4:46-48, 1992.

Memberg W.D., Peckham PH, Thrope GB, Keith MW, Kicher T.P.: An analysis of the reliability of percutaneous intramuscular electrodes in upper extremity fns applications. IEEE Trans Rehab Eng 1(2):1-8, 1993.

Peckham PH, Keith MW, Stroh K.C., Kilgore K.L., Hart R.: Restoration of functional grasp-release in tetraplegia with implantable neuromuscular stimulation and tendon transfer. Electrophysiological Kinesiology 5:269-274, 1993.

Kilgore K.L., Peckham PH: Grasp Synthesis for Upper-Extremity FNS: Part 1 Automated method for synthesizing the stimulus map. Med. & Biol. Eng. And Comput., 31:607-614, 1993.

Kilgore K.L., Peckham PH: Grasp synthesis for upper-extremity fns. part 2 evaluation of the influence of electrode recruitment properties. Med. & Biol. Eng. And Comput. 31:615-622, 1993.

Mulcahey M.J., Smith B.T., Betz R., Triolo R.J., Peckham PH: Functional neuromuscular stimulation: outcomes in young people with tetraplegia. J Am Paraplegia Soc 17:20-35, 1994.

Wuolle K.S., Van Doren C.L., Thrope GB, Keith MW, Peckham PH: Development of a quantitative hand grasp and release test for patients with tetraplegia using a hand neuroprosthesis. J Hand Surg 19A:209-218, 1994.

Memberg W.D., Peckham PH, Keith MW: A surgically implanted intramuscular electrode for an implantable neuromuscular stimulation system. IEEE Trans Rehab Eng, 2(2):80-91, 1994.

Tang Z., Smith B., Schild J.H., Peckham PH: Data transmission from an implantable biotelemeter by load-shift keying using circuit configuration modulator. IEEE Trans Biomed Eng 42(5):525-528, 1995.

Sheth, N.V., Dell'Osso L.F., Leigh R.J., Van Doren C.L., Peckham PH: The effects of afferent stimulation on congenital nystagmus foveation periods. Vision Res. 35(16):2371-2382, 1995.

Keith MW, Kilgore K.L., Peckham PH, Wuolle K.S., Creasey G., Lemay M.: Tendon transfers and functional electrical stimulation for reconstruction of hand function in spinal cord injury. J Hand Surg 21A:89-99, 1996.

Peckham PH, Gray D.: Functional neuromuscular stimulation (FNS). J. Rehab R&D. 33(2) April 1996.

Peckham PH, Thrope G., Woloszko J., Habasevich R., Scherer M., Kantor C: Technology transfer of neuroprosthetic devices. J. Rehab R&D, 33(2) April 1996.

Scott TRD, Peckham PH, Kilgore KL: Tri-state myoelectric control of bilateral upper extremity neuroprostheses for tetraplegic individuals. IEEE/Trans. Rehab. Eng. 4:251-263, 1996.

Scott T, Bhadra, Kilgore K, Peckham PH: The monitoring of tendon tension with an implantable intratendon probe and its use in the control of neuroprostheses. IEEE/Trans. Rehab. Eng (Communications) 5(2):233-235, June 1997.

Akers JM, Peckham PH, Keith MW, Merritt K: Tissue response to chronically stimulated implanted epimysial and intramuscular electrodes. IEEE Trans. Rehab. Eng. 5(2):207-220, 1997.

Gorman PH, Wuolle KS, Peckham PH, Heydrick D: Patient selection for an upper extremity neuroprosthesis in tetraplegic individuals. Spinal Cord 35:569-573, 1997.

Kilgore K.L., Peckham PH, Keith MW, Thrope GB, Wuolle K.S., Bryden A.S., Hart R.L.: An implanted upper extremity neuroprosthesis: A five patient review. J Bone Joint Surg, 79A(4):533-541, April 1997.

Bhadra N, Peckham PH: Peripheral nerve stimulation for restoration of motor function. J Clin Neurophysiology 14(5):378-393, 1997.

Gorman PH, Kikta DG, Peckham PH. Neurophysiologic evaluation of lower motor neuron damage in tetraplegia. Muscle & Nerve 21: 1321-1323 (1998).

Smith B, Tang Z, Johnson M, Pourmehdi S, Gazdik M, Buckett J, Peckham P: An externally powered, multichannel, implantable stimulator-telemeter for control of paralyzed muscle. IEEE Trans Rehab Eng 45(4):463-475, April 1998.

Grill J.H., Peckham PH: Functional neuromuscular stimulation for combined control of elbow extension and hand grasp in c5 and c6 quadriplegics. IEEE Trans. Rehab. Eng., 6, 190-199, 1998.

Hart RL, Kilgore KL, Peckham PH: A comparison between control methods for implanted fcs hand grasp systems. IEEE Trans. Rehab. Eng., 6(2):208-218, 1998.

Kilgore KL, Lauer RT, Peckham PH: A transducer for the measurement of finger joint moments. IEEE Trans. Rehab Eng 6(4):424-429, 1998.

Wuolle KS, Van Doren CL, Bryden A, Peckham PH, Keith MW, Kilgore KL, Grill J: Satisfaction with and usage of a hand neuroprosthesis. Arch Phys Med Rehabil 80:206-213, 1999.

Lauer RT, Kilgore KL, Peckham PH, Bhadra N, Keith MW: The function of the finger intrinsic muscles in response to electrical stimulation. IEEE Trans. Rehab Eng., 7(1):19-26, 1999.

Pourmehdi S., Strojnik P., Peckham H., Buckett J., Smith B.: A custom designed chip to control an implantable stimulator and telemetry system for control of paralyzed muscles. Artificial Organs 23(5):396-398, 1999.

Lauer R.T., Peckham P.H., Kilgore K.L.: EEG-based control of a hand grasp neuroprosthesis. NeuroReport, 10(8):1767-1771, February 1999.

Johnson MW, Peckham PH, Bhadra N, Kilgore KL, Gazdik MM, Keith MW, Strojnik P: An implantable transducer for two-degree-of-freedom joint angle sensing. IEEE Trans. Biomed. Eng., 7(3):349-359, September 1999.

Deitz J., Quatrano L., Peckham P.H., Bach-Y-Rita P., Cooper L. D., Joe J.: Review of the NCMRR Grant Portfolio: The First Five Years. Arch. PM&R. 80:481-484, 1999.

Lauer RT, Peckham PH, Kilgore KL, Heetderks WJ: Applications of cortical signals to neuroprosthetic control: A Critical Review. IEEE Trans. Rehab. Eng. 8(2):205-208, June 2000.

Wolpaw JR, Birbaumer N, Heetderks WJ, McFarland DJ, Peckham PH, Schalk G, Donchin E, Quatrano LA, Robinson CJ, Vaughan TM: Brain-Computer interface technology: A review of the first

international meeting. IEEE Trans. Rehab. Eng. 8(2):164-173, June 2000.

Creasey GH, Kilgore KL, Brown-Triolo DL, Dahlberg JE, Peckham PH, Keith MW: Reduction of costs of disability using neuroprostheses. Assistive Technology 12:67-75, 2000.

Bhadra N, Kilgore KL, Peckham, PH: Implanted stimulators for restoration of function in spinal cord injury. Medical Engineering and Physics 23:19-28, 2001.

Peckham PH: Restoration of function: Current challenges and future opportunities through electrical stimulation. (Guest Editorial). JRR&D 38(1):xiii, January/February 2001.

Peckham PH, Keith MW, Kilgore KL, Grill JH, Wuolle KS, Thrope GB, Gorman P, Hobby J, Mulcahey MJ, Carroll S, Hentz VR, Wiegner A: Efficacy of an implanted neuroprosthesis for restoring hand grasp in tetraplegia: A multicenter study. Arch PM&R 82:1380-1388, October 2001.

Grill WM, McDonald JW, Heetderks WH, Kocsis JD, Weinrich M, Peckham PH. At the interface: convergence of neural regeneration and neural prostheses for restoration of function, J. Rehab. Research and Development, 38(6), November 2001, In press.

Peckham PH, Kilgore KL, Keith MW, Bryden A, Crago PE, Bhadra N, Buckett JR, Montague FW, Gazdik MM, Smith B: An advanced neuroprosthesis for restoration of hand and upper arm control employing an implantable controller. J. Hand Surg. 27A:265-276, 2002.

Bhadra N, Peckham PH, Kilgore KL, Keith MW, Montague F, Gazdik M, Stage T: Implementation of an implantable joint angle transducer. Accepted, J Rehab R&D, June 2001.

Knutson JS, Naples GG, Peckham PH, Keith MW. Fracture rates and occurrences of infection and granuloma associated with percutaneous intramuscular electrodes in upper extremity functional electrical stimulation applications. J. Rehab Research and Development, August 2001, Submitted.

Brown DL, Peckham PH, Kilgore KL, Keith MW: Economic impact of an upper extremity neuroprosthesis for functional restoration. Submitted to Arch PM&R.

Peckham PH: Enhancement of upper extremity function in people with tetraplegia. Accepted Physical Therapy, 2001.

Wuolle KS, Van Doren CL, Wijman CAC, Peckham PH, Keith MW: Assessment of hand function in tetraplegic patients using a hand neuroprosthesis for activities of daily living. Am J Occup Ther. In revision, 1998.

## BOOK CHAPTERS

Peckham PH, Van Der Meulen J.P., Reswick J.G.: Electrical Activation of Skeletal Muscle by Sequential Stimulation. The Nervous System and Electric Currents, Edt. N.L. Wulfsohn and A. Sances, Jr., Plenum Press, 1970.

Mortimer JT, Peckham PH: Electrical Excitation of Paralyzed Muscle in the Upper Extremity. Functional Neuromuscular Stimulation, National Academy of Sciences, Washington, D.C., p. 39-476, 1972.

Mortimer JT, Peckham PH: Intramuscular Electrical Stimulation. Neural Organization and its Relevance to Prosthetics, Edts. W.S. Fields and L.A. Leavitt, Intercontinental Medical Book Corporation, New York, p. 131-146, 1973.

Peckham PH, Mortimer JT: Restoration of Hand Function in the Quadriplegic through Electrical Stimulation. Functional Electrical Stimulation, Application in Neural Prostheses Edts. F.T. Hambrecht and J.B. Reswick. Marcel Dekker, New York, p. 83-95, 1977.

Peckham PH, Thrope GB, Buckett JR, Freehafer AA, Keith MW: Coordinated Two Mode Grasp in the Quadriplegic Initiated by Functional Neuromuscular Stimulation. In IFAC Control Aspects of Prosthetics and Orthotics, R.M. Cambell, ed., Pergamon Press, New York, 1983.

Peckham PH, Freehafer AA, Keith MW: The Influence of Muscle Properties in Tendon Transfer. In Clinical Mechanics of the Hand, Paul W. Brand, ed., C.V. Mosby Company, St. Louis, 1985.

Peckham PH: Functional Activation of the Paralyzed Extremities. In Encyclopedia of Neuroscience, Vol. II, G. Adelman, ed., Birkhauser, Boston, pp. 916-919, 1987.

Freehafer AA, Kelly C.M., Peckham PH: Planning tendon transfers in tetraplegia Cleveland technique. In Tendon Surgery in the Hand, J.M. Hunter, L.H. Schneider, E.J. Maekin, eds., C.V. Mosby Company, St. Louis, 1987.

Peckham PH: Functional Electrical Stimulation. In Encyclopedia of Medical Devices and Instrumentation. John Webster, Ed., John Wiley & Sons, Inc., New York, vol. 2, pp. 1331-1352, 1988.

Freehafer AA, Peckham PH, Keith MW: Surgical treatment for tetraplegia: Upper limb. In Operative Orthopaedics. Michael W. Chapman, Ed., J.B. Lippincott Co., Philadelphia, vol. 2, 1459-1467, 1988.

Freehafer AA, Peckham PH, Keith MW: New concepts on treatment of the upper limb in the tetraplegic: Surgical restoration and functional neuromuscular stimulation. In Hand Clinics. Raoul Tubiana Ed., W.B. Saunders Company, Philadelphia, vol. 4(4), 563-574, 1988.

Peckham PH, Keith MW: Motor prosthesis for restoration of upper extremity function. In Neural Prosthesis: Replacing Motor Function After Disease or Disability, Eds. R.M. Stein and P.H. Peckham, D. Popovic' Oxford University Press, New York, 1992.

Scott T.R., Peckham PH, Keith MW: Upper Extremity Neuroprostheses Utilizing Functional Electrical Stimulation. In Neuroprostheses, D. Rushton, G. Brindley, eds. 1995.

Scott T., Peckham PH: Functional Electrical Stimulation and its Application in the Management of Spinal Cord Injury. In Diagnosis and Management of Disorders of the Spinal Cord, Eds. R.M. Woolsey and R.R. Young, W.B. Saunders, Philadelphia, 1995.

Peckham PH, Smith B.: Implantable Stimulators for Neuromuscular Control. Medical Instruments and Devices The Biomedical Engineering Handbook, W. Van Maltzahn, Section Editor, CRC Press, , 1995.

Pourmehdi S., Peckham PH: Implantable stimulators and control systems. In IEEE Electronics Engineers Handbook, 4th Ed., Donald Christiansen, Ed., McGraw-Hill Book Co, Huntington, NY, 1996.

Peckham, P.H.: Enhancing Human Movement in the 21st Century: Internal to External Dimension. In Designing and Using Assistive Technology: The Human Perspective. Gray D. et al, Brookes Publishing Co., Baltimore, MD, 1998.

Peckham P.H.: Paralyzed extremities, functional activation. In Encyclopedia of Neuroscience, 2<sup>nd</sup> edition, G. Adelman, B. Smith, Eds., Elsevier Science B.V., pp. 1583-1586, 1999.

Peckham P.H.: Principles of Electrical Stimulation. In Creasey G.H., Peckham P.H. (Issue eds): Topics in Spinal Cord Injury Rehabilitation: Functional Electrical Stimulation. Thomas Land Pub, 5(1):1-5, Summer 1999.

Peckham P.H., Keith M.W., Kilgore K.L.: Restoration of Upper Extremity Function in Tetraplegia: Creasey G.H., Peckham P.H. (Issue eds): Topics in Spinal Cord Injury Rehabilitation: Functional Electrical Stimulation. Thomas Land Pub, 5(1):33-43, 1999.

Strojnik P, Peckham PH: Implantable Stimulators for Neuromuscular Control in The Biomedical Engineering Handbook, Second Edition, Ed. Bronzino JD, CRC Press, Chp. 78, 2000.

Kilgore, K.L, Peckham, P.H: Coordinated Electrical Stimulation of Grasp and Release for C5 and C6 Quadriplegic Patient. In Neural Prostheses, Robert Maciunas, Ed, American Association of Neurological Surgeons 17:315-330, 2000.

Kilgore KL, Peckham PH, Keith MW, Advances in Upper Extremity Functional Restoration Employing Neuroprosthese, in Neural Prostheses for Restoration of Sensory and Motor Function, ed. Moxon K, Gaal G, eds., CRC Press, 2:45-74, 2000.

### **BOOKS AND EDITED JOURNALS**

Gorman P.H., Peckham PH: Journal of Neurologic Rehabilitation. Special Focus Issue: Interventional Approaches to Restoration of Motor Function. Demos Publications, New York, Volume 5, No. 1 and 2, 1991.

Stein R.M., Peckham PH, Popovic` D: Neural Prosthesis: Replacing Motor Function After Disease or Disability, Oxford University Press, New York, 1992.

Peckham PH: Journal of Rehabilitation Research and Development, 33, No. 2, 1996.

Robinson CJ, Peckham PH, Hoshimiya N. (eds): Special Section on Functional Electrical Stimulation. IEEE Trans on Rehabilitation Engineering Vol. 4, No. 2, December 1996.

Creasey G.H., Peckham P.H. (Issue eds): Topics in Spinal Cord Injury Rehabilitation: Functional Electrical Stimulation. Thomas Land Pub, 5(1), Summer 1999.

### **INVITED LECTURES/PRESENTATIONS**

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.

Annual Neural Prosthesis Workshops, 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.

American Paraplegia Society Special Seminar on Upper Limb Surgical Reconstruction and Rehabilitation, "Technical Advances in Upper Limb Rehabilitation", Las Vegas, Nevada, August 23, 1983.

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.

OH 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.

Veterans Administration Subcommittee on Hospitals and Health Care, Committee on Veterans Affairs, House of Representatives. Functional Electrical Stimulation of the Upper Limbs. May 8, 1984, Washington, D.C.

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 and Future Prospects for Control of the Extremities", London, October 15-16, 1984.

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.

Heiner Sell Lecture, "State of the Art in Functional Neuromuscular Stimulation", Fifth Annual Scientific Meeting of the American Spinal Injury Association, Atlanta, Georgia, April, 1985.

Canadian National SCS Convention, "Restoration of Grasp Through Functional Neuromuscular Stimulation", Hamilton, Ontario, June, 1985.

Japanese Society for Biomechanics, Functional Electrical Stimulation Seminar, Toyota Foundation, Tokyo and Osaka, Japan, August, 1985.

Engineering Foundation Conference, Neural Prosthesis: Motor Control. New England College, Henniker, NH, August, 1985.

XIIIth World Congress of Neurology, Invited Session Chairman and Presentation "State of Art of FNS", Hamburg, Germany, September, 1985.

Functional Neuromuscular Stimulation for Control of the Paralyzed Extremity. Kessler Institute for Rehabilitation Conference, East Orange, N.J., November 2-3, 1985.

Functional Neuromuscular Stimulation. Sixteenth Neural Prosthesis Workshop, NIH, Washington, D.C., November 6-8, 1985.

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.

(Key Note Speaker) Functional Electrical Stimulation. Neurological Trauma: The Road to Re-Entry, 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.

(Keynote Speaker) Technology Transfer of an Upper Extremity Neuroprosthesis for Restoration of Hand Function. 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.

(Keynote Speaker): Experiences in the Upper Extremity: Ongoing Multi-Center Clinical Trials and Future Directions. 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, Biomechanics Program, 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”, 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.

30th 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 ASNR, 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: Keynote Address: Upper Extremity Neuroprostheses: Lessons Learned from Research through Clinical Trials, IFESS 2000, Aalborg, Denmark, June 18-21, 2000.

Alfred E. Mann Institute for Biomedical Engineering, University of Southern California, *Putting the Brain in Command* “State of the Art in Functional Electrical Stimulation (FES) for Reach and Grasp”, 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 special 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. Symposium “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: Whitaker Foundation Biomedical Engineering Conference, LaJolla, CA, 8/10/01.

Peckham PH: Neuroprostheses for Restoration of Function. National Academy of Engineering, Irvine, CA, 9/13-15/01

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

Peckham PH: Perspectives of a Biomedical Engineer. Mentorship: Developing Physiatrists into Independent Investigators, 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. Visiting Professor, IGERT Seminar Series, Arizona State University, 3/21/02.

## **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.

Keith MW, Peckham PH, Thrope GB, Menger V., Freehafer AA: Implementation of an Upper Extremity Functional Neuromuscular Electrical Stimulation. American Orthopaedic Association 99th Annual Meeting, Hot Springs, Virginia, June 23-26, 1986.

Buckett JR, Braswell S.D., Peckham PH, Smith B., Thrope GB: A Multichannel Portable Functional Electrical Stimulation System. RESNA 9th Annual Conference, pp. 432-434, Minneapolis, Minnesota, June 1986.

Menger V.L., Thrope GB, Peckham PH: Clinical Assessment of the Case Neural Prosthetic Functional Neuromuscular Stimulation Hand System. RESNA 9th Annual Conference, pp. 270-272, Minneapolis,

Minnesota, June 1986.

Kilgore K.L., Peckham PH, Keith MW, Thrope GB: Characterization of a Lateral Prehension-Release Grasp Using Functional Neuromuscular Stimulation. RESNA 9th Annual Conference, pp. 451-453, Minneapolis, Minnesota, June 1986.

Johnson M.W., Peckham PH: Evaluation of Shoulder Position as a Command Control Source for use with Neural Prosthetic Devices by Quadriplegic Individuals. RESNA 9th Annual Conference, pp. 454-456, Minneapolis, Minnesota, June 1986.

Peckham PH, Keith MW, Thrope GB, Menger V.L., Stroh K., Buckett JR, Smith B.: Implementation of a Functional Neuromuscular Stimulation Neuroprosthesis for Control of the Tetraplegic Hand. Proceedings of the IEEE/Eighth Annual Conference of the Engineering in Medicine and Biology Society, Dallas, Texas, November, 1986.

Crago P.E., Owens N.E., Tills K., Thrope GB, Peckham PH, Keith MW: Open and Closed-Loop Control of FNS Hand Grasp. Proceedings of the IEEE/Eighth Annual Conference of the Engineering in Medicine and Biology Society, Dallas, Texas, November, 1986.

Peckham PH, Smith B., Buckett JR, Thrope GB, Keith MW: Implantable Stimulator System for Control of Paralyzed Muscle. Government Microcircuit Applications Conference, San Diego, California, November, 1986.

Crago P.E., Peckham PH, Kilgore K., Tills K., Thrope GB: Coordination and Cocontraction in Open and Closed Loop Control of Grasp Through Functional Neuromuscular Stimulation. Society for Neuroscience, Washington, DC, November 1986.

Buckett JR, Johnson M.W., Thrope GB, Ignagni A.R., Peckham PH: A Man/Machine Interface for Control of an Upper Extremity Functional Neuromuscular Stimulation System. RESNA 10th Annual Conference, San Jose, CA, June, 1987.

Mendelson L.M., Peckham PH, Keith MW, Freehafer AA: Analysis of Tendon Transfer Surgery in the Tetraplegic Upper Extremity. Society for Neuroscience. Society for Neuroscience, New Orleans, LA, November, 1987.

Buckett JR, Peckham PH, Smith B., Thrope GB, Keith MW: A Modular Approach to a Functional Neuromuscular Stimulation System: The Portable Control Hardware. IEEE/EMBS Meeting, Boston, MA, November, 1987.

Smith B., Peckham PH, Gazdik M., Letechipia J.E., Banks S.A., Keith MW: Development and Evaluation of an Externally Powered, Multichannel, Implantable Stimulator. IEEE/EMBS Meeting, Boston, MA, November, 1987.

Hart R.L., Peckham PH, Crago P.E.: Evaluation of a Three-Dimensional Tracking System to Monitor Hand Kinematics. IEEE/EMBS Meeting, Boston, MA, November, 1987.

Peckham PH, Keith MW, Thrope GB, Memberg W.D.: Intramuscular Electrodes for Neuromuscular Stimulation. IEEE/EMBS Meeting, Boston, MA, November, 1987.

Peckham PH: Restoration of Grasp in the Tetraplegic Using an Implantable Stimulator. International Med. Soc. of Paraplegic, 27th Annual Scientific Meeting, Perth Western Australia, May 10-12, 1988.

Peckham PH, Marsolais EB: Advances in the Development of Upper and Lower Extremity FNS Systems. Applied Neural Control Research Day, Cleveland, OH, May 23, 1988.

Thrope GB, Stroh K.C., Crago P.C., Peckham PH: Quantitative Assessment of Object Acquisition and Release Using a Neural Prosthetic Hand System with C5 and C6 Quadriplegics. International Conference of the Association for the Advancement of Rehabilitation Technology (ICAART 88), Montreal, Quebec, Canada, June 25-30, 1988.

Johnson M.W., Buckett JR, Peckham PH: A Miniature Hall-Effect Joystick Transducer: The next generation. International Conference of the Association for the Advancement of Rehabilitation Technology (ICAART 88), Montreal, Quebec, Canada, June 25-30, 1988.

Stroh K., Thrope G., Peckham P., Keith M., Menger V.: Candidate Selection for use with a Functional Neuromuscular Stimulation Hand System. International Conference of the Association for the Advancement of Rehabilitation Technology (ICAART 88), Montreal, Quebec, Canada, June 25-30, 1988.

Kilgore K.L., Thrope GB, Peckham PH: Rule Based Procedures for Developing Hand Grasp Parameters in FNS. International Conference of the Association for the Advancement of Rehabilitation Technology (ICAART 88), Montreal, Quebec, Canada, June 25-30, 1988.

Kilgore K.L., Thrope GB, Peckham PH: A Clinical Procedure for Characterizing Electrode/Muscle Output. International Conference of the Association for the Advancement of Rehabilitation Technology (ICAART 88), Montreal, Quebec, Canada, June 25-30, 1988.

Peckham PH: Upper Extremity Neural Prostheses. Engineering Foundation Conference, Potosi, Missouri, July 17-22, 1988.

Peckham PH, Keith MW, Thrope GB, Stroh K.C.: Upper Extremity Assist Devices. World Congress on Medical Physics and Biomedical Engineering, San Antonio, Texas, August 6-12, 1988.

Peckham PH, Keith MW, Thrope GB, Stroh K.C.: Upper Extremity Assist Devices. National Spinal Cord Injury Association, Denver, Colorado, August 11-13, 1988.

Mendelson L.S., Peckham PH, Freehafer AA, Keith MW: Assessment of Tendon Transfer Surgery in the Tetraplegic Upper Extremity. *Innov. Tech Biol. Med.* 9:281-293, France, 1988.

Peckham PH: "Functional Nerve Stimulation - A National Center Concept", National Coordinating Council on Spinal Cord Injury, Semi-Annual Meeting, St. Louis, Missouri, May 11-12, 1989.

Hart R.L., Thrope GB, Stroh K.C., Peckham PH, Keith MW, Ignagni A.R., Buckett JR, Kilgore K.L., Woods L., Makuch W.: Technology Transfer of an Upper Extremity Functional Neuromuscular Stimulation Program. RESNA 12th Annual Conference, New Orleans, Louisiana, June 25-30, 1989.

Memberg W.D., Peckham PH, Thrope GB, Keith MW: A Retrospective Analysis of Percutaneous Intramuscular Electrodes for Functional Neuromuscular Stimulation in Quadriplegic Subjects. RESNA 12th Annual Conference, New Orleans, Louisiana, June 25-30, 1989.

Peckham PH: Functional Electrical Stimulation for Restoration of Upper Extremity Movement. 21st International Developmental Disabilities Conference on Rehabilitation, Bologna, Italy, November 1-15, 1989.

Memberg W.D., Peckham PH, Keith MW, Gazdik M: A Surgically-Implanted Intramuscular Electrode for an Implantable Neuromuscular Stimulation System. IEEE Engineering in Medicine and Biology Society, November 1989.

Peckham PH, Keith MW, Smith B., Marsolais EB, Memberg W., Kilgore K.: Implantable Systems for

Neuromuscular Stimulation. Proceedings Osaka International Workshop on Functional Neuromuscular Stimulation, Osaka, Japan, November 15-22, 1989.

Tang Z., Smith B., Peckham PH: An implantable multichannel biotelemeter for EMB acquisition. 5th Annual Applied Neural Control Research Day, Cleveland, OH May 1990.

Peckham PH: Sixth Annual Canadian Paraplegic Association Spinal Cord Research Symposium, Halifax, Nova Scotia, October 12, 1990

Ignagni A.R., Buckett JR, Peckham PH: A Programming and Data Retrieval System for an Upper Extremity FES Neuroprosthesis. Twelfth Annual IEEE Conference, Philadelphia, PA, November 1-4, 1990.

Johnson M.W., Peckham PH: An Implantable Two-Degree-of-Freedom Joint Angle Transducer. Twelfth Annual IEEE Conference, Philadelphia, PA, November 1-4, 1990.

Peckham PH, Thrope GB, Naples G., Stroh K.C., Hart R., Keith MW, Gorman P.: System for Restoring Grasp Release. 4th International Congress on Upper Extremity Reconstruction, Palo Alto, CA, March 13-16, 1991.

Stroh K.C., Van Doren C., Peckham PH, Keith MW: Quantitative Evaluation of Performance of FES Systems for Restoring Grasp-Release in 0:1, 0Cu:1, and 0Cu:2 Tetraplegia. 4th International Congress on Upper Extremity Reconstruction, Palo Alto, CA, March 13-16, 1991.

Keith MW, Peckham PH: A Decision Algorithm for Treatment of High Level Tetraplegia Including FES and Tendon Transfer. 4th International Congress on Upper Extremity Reconstruction, Palo Alto, CA, March 13-16, 1991.

Peckham PH, Thrope GB, Keith MW, Naples G., Stroh K.C., Gorman P.H.: Multi-site Evaluation of a FES Motor Prosthesis for Hand Function. American Spinal Injury Association Meeting, Seattle, WA, April 8-10, 1991.

Tang Z., Smith B., Peckham PH: An implantable multichannel biotelemeter for FES command control signal acquisition. Third International Neuroprostheses Conference: Motor Control,, Banff, Alberta, Canada, August, 1991.

Peckham PH, Keith MW, Thrope GB, Naples G., Stroh K.C., Hart R.L., Gorman P.H.: Multi-Center Evaluation of a Motor Prosthesis for Restoration of Hand Function. Biomedical Engineering Society, Charlottesville, VA, October 12-14, 1991.

Peckham PH: Cortical Control of Neural Prostheses. 25th Winter Conference on Brain Research, Steamboat Springs, Colorado, January 25-Feb. 1, 1992.

Peckham PH: Restoration of Prehension in Tetraplegics Using Implantable Electrical Stimulation. PROPARA, Montpellier, France, February 2-4, 1992.

Keith MW, Peckham PH, Stroh K.C., Kilgore K.L., Hart R.L.: Restoration of Functional Grasp-Release in Tetraplegia with Implantable Neuromuscular Stimulation and Tendon Transfers. American Spinal Injury Association Meeting, Toronto, Ontario, May 8-10, 1992.

Mulcahey M.J., Betz R.R., Smith B.T., Triolo R.J., Weiss A.A., Keith MW, Peckham PH, Mitra A.: Bipolar Latissimus Dorsi Transposition and Functional Neuromuscular Stimulation to Restore Elbow Flexion in a C4 Quadriplegic with C5 Denervation. American Spinal Injury Association Meeting, Toronto, Ontario, May 8-10, 1992.

Peckham PH, Keith MW, Kilgore K.L., Stroh K.C., Hart R.L.: Surgical Alterations and Functional Electrical Stimulation for Restoration of Hand Function. RESNA International '92, Toronto, Canada, June 6-11, 1992.

Thrope GB, Naples G.G., Hart R.G., Stroh K.C., Buckett JR, Ignagni A.R., Keith MW, Peckham PH, Van Doren C.L. Technology Transfer of a Functional Electrical Stimulation Hand System. RESNA International '92, Toronto, Canada, June 6-11, 1992.

Peckham PH, Keith MW, Stroh K.C., Kilgore K.L., Hart R.L.: Restoration of Functional Grasp-Release in Tetraplegia with Implantable Neuromuscular Stimulation and Tendon Transfer. 9th International ISEK Conference, Florence, Italy, June 1992.

Peckham PH, Keith MW, Kilgore K.L., Stroh K.C., Hart R.L., Smith B., Buckett JR, Thrope GB: Implantable Systems for Control of the Paralyzed Upper Extremity in Spinal Cord Injury. International Symposium on Therapeutic Stimulation, Liverpool, England, August 24-28, 1992.

Peckham PH, Thrope GB, Keith MW, Naples GG, Smith B, Van Doren .L, Kilgore KL: Technology Transfer of an Upper Extremity Neuroprosthesis for Restoration of Hand Function. 4th Vienna International Workshop on Functional Electrostimulation, Vienna Austria, September 24-27, 1992.

Peckham PH, Zajac F.E., Hentz V.R., Keith MW, (Panel Discussion): Neural Prostheses and Surgical Reconstruction of Upper Extremity Function. Winter Conference on Brain Research, Whistler, British Columbia, January 23-30, 1993.

Kilgore K.L., Peckham PH, Thrope GB, Keith MW: Implementation of an Implanted Upper Extremity Neuroprosthesis in the Clinical Setting. ASIA, San Diego, CA May 10-12, 1993.

Kilgore K.L., Peckham PH, Keith MW, Thrope GB: An Implanted Upper Extremity Neuroprosthesis. RESNA '93, Las Vegas, Nevada, June 12-17, 1993.

Peckham PH, Kilgore K.L., Keith MW, Thrope GB, Betz R.: An Implanted Neuroprosthesis for Restoration of Grasp and Release. The Ljubljana FES Conference, Ljubljana, Slovenia, August 22-26, 1993.

Peckham PH, Keith MW, Kilgore K.L., Stroh K.C., Hart R.L.: Control of Grasp and Release in C5 and C6 Spinal Cord Injury with Implantable Functional Electrical Stimulation. American Paraplegia Society, Las Vegas, Nevada, September 7-9, 1993.

Hart R.L., Kilgore K.L., Peckham PH: A Lock Detection Algorithm For Shoulder Control of A Hand Grasp Neuroprosthesis. Engineering Foundation, Neural Prostheses: Motor Systems IV Conference, Deer Creek, OH, July, 1994.

Peckham PH: Neural Prostheses for Motor Control. COST219 Conference, Tregestal, France, June 6-8, 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.

Kilgore K., Lauer R.T., Peckham PH: A Transducer for Measurement of Finger Joint Torques. 16th IEEE/EMBS Conference, Baltimore, Maryland, November 3-6, 1994.

Lemay M.A., Crago P.E., Keith MW, Peckham PH: Wrist Flexion/Extension Control in C5 and C4 Quadriplegic Subjects Using Functional Neuromuscular Stimulation. 16th IEEE/EMBS Conference,

Baltimore, Maryland, November 3-6, 1994.

Johnson M.W., Peckham PH: An Implantable Transducer for Two-Degree-of-Freedom Joint Angle Sensing. 16th IEEE/EMBS Conference, Baltimore, Maryland, November 3-6, 1994.

Tang Z., Peckham PH: Multichannel Implantable Stimulation and Telemetry System for Neuromuscular Control. 16th IEEE/EMBS Conference, Baltimore, Maryland, November 3-6, 1994.

Tang Z., Smith B., Peckham P. A Radio-Frequency Powering and Communications Link For Implantable Systems. 13th International Symposium on Biotelemetry, Williamsburg, VA, March 26-31, 1995.

Peckham PH, Wuolle K.S., Van Doren C., Keith MW: Functional Assessment of a Hand Neuroprosthesis for Tetraplegic Patients. Surgical Rehabilitation of Upper Limb in Tetraplegia, Vth International Conference, Melbourne, Australia, March 26-29, 1995.

Peckham PH, Wijman C.A.C., Keith MW: Finger Grasp and Key Pinch Strength in Tetraplegia after Tendon Transfer Surgery: Effect of Forearm and Wrist Position. Surgical Rehabilitation of Upper Limb in Tetraplegia, Vth International Conference, Melbourne, Australia, March 26-29, 1995.

Peckham PH, Mendelson L.S., Keith MW, Freehafer AA: Assessment of Muscle Firing Patterns after Tendon Transfer Surgery in the Tetraplegic Upper Extremity. Surgical Rehabilitation of Upper Limb in Tetraplegia, Vth International Conference, Melbourne, Australia, March 26-29, 1995.

Peckham PH, Keith MW, Thrope GB, Grill J.H.: A Multi-Center Study for Evaluation of a Hand Neuroprosthesis for Grasp-Release Function. Surgical Rehabilitation of Upper Limb in Tetraplegia, Vth International Conference, Melbourne, Australia, March 26-29, 1995.

Kilgore K., Peckham PH, Keith MW: An Implanted Upper Extremity Neuroprosthesis: A Twenty Patient Follow-Up. ASIA, Orlando, Florida, May 1-3, 1995.

Lauer, R.T., Kilgore, K.L., Peckham PH: Control of the Hand Intrinsic Muscles by Functional Electrical Stimulation. RESNA, Vancouver, Canada, June 9-14, 1995.

Keith MW, Kilgore K.L., Peckham PH, Wuolle K.S.: Tendon Transfers and Functional Electrical Stimulation For Restoration of Hand Function In Spinal Cord Injury. American Society for Surgery of the Hand, 50th Annual Meeting, San Francisco, CA September 13-16, 1995.

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

K.L. Kilgore, P.H. Peckham, M.W. Keith, A.M. Bryden, K.S. Wuolle, Restoration of Grasp and Release with an Implanted Neuroprosthesis, IFESS '96, Cleveland, OH, May, 1996.

Peckham PH, Keith MW, Kilgore K.L., Wuolle K.S., Bryden A.S.: Restoration of Grasp and Release with an Implanted Neuroprosthesis. 35th Annual Scientific Meeting of the IMSOP, Atlanta, GA, August 1996.

K.L. Kilgore, R.L. Hart, P.H. Peckham, Wrist Control of an Upper Extremity Neuroprosthesis, American Paraplegia Society, 42nd Annual Conference, Las Vegas, NV, Sept. 1996.

Peckham P.H.: Functional Neuromuscular Stimulation in Spinal Cord Injury Rehabilitation. American Academy of Physical Medicine and Rehabilitation, 59th Annual Assembly, Atlanta, GA, November 13-

15, 1997.

Wuolle K.S., Van Dorey C.L., Bryden A., Peckham PH, Keith M.W., Kilgore K.L.: Satisfaction and usage of a hand grasp neuroprosthesis. VI International Conference on Surgical Rehabilitation of the Upper Limb in Tetraplegia, Cleveland, OH 5/20-23/98.

K.L. Kilgore, P.H. Peckham, M.W. Keith, N. Bhadra, A.M. Bryden: A second generation implanted upper extremity neuroprosthesis. VI International Conference on Surgical Rehabilitation of the Upper Limb in Tetraplegia, Cleveland, OH 5/20-23/98.

R Lauer, PH Peckham, D McFarland, J Wolpaw "An EEG-based Controller for FNS Hand Grasp Systems" (Poster). VI International Conference, Surgical Rehabilitation of the Upper Limb in Tetraplegia, Cleveland, OH 5/20-23/98.

R Lauer, PH Peckham, D McFarland, J Wolpaw "Pilot Study on an EEG-based Controller for FNS Hand Grasp Systems" . Biomedical, Engineering Society 1998 Annual Meeting, Cleveland, OH 9/98.

Peckham PH: Restoration of Hand Function in Tetraplegia with FES. 2<sup>nd</sup> World Congress in Neurological Rehabilitation. Toronto, Canada, April 14-17, 1999.

Peckham PH: Restoration of Upper Limb Function Using Electrical Stimulation. American Paraplegia Society Meeting, Las Vegas, NV, September 7-9, 1999.

Peckham PH: Examples of FES Applications for Grasping Restoration: FreeHand System, First INAIL/SSA Workshop on Functional Electrical Stimulation for Upper Limb Functional Restoration, Florence, Italy, Feb. 7-8, 2000.

Wuolle KS, Peckham PH. Satisfaction with upper extremity surgery in individuals with tetraplegia, American Paraplegia Society, 2000

Kilgore KL, Peckham PH, Keith MW, Bryden AM, Bhadra N, Hart RL: Clinical Evaluation of a Second Generation Implanted Upper Extremity Neuroprosthesis, American Paraplegia Society, 46th Annual Conference, Las Vegas, NV, Sept. 5-7, 2000.