

NAME: John Peter Scholz

ADDRESS: 1 Tanglewood Lane, Newark, DE 19711

WORK TELEPHONE: (302) 831-6281.

ELECTRONIC MAIL: jpscholz@udel.edu

**HIGHER
EDUCATION:**

Sept., 1983-Dec., 1986: Ph.D., University of Connecticut, Experimental Psychology:
Motor Control. Major Advisor: J. A. Scott Kelso, Ph.D.

1981-1983: The University of Connecticut, Department of Biobehavioral Sciences,
Developmental Psychobiology.

1976-1978: M.A., The University of North Carolina at Chapel Hill, N.C. Major Advisor:
Suzann K. Campbell, Ph.D., PT

1972-1973: The University of Pennsylvania School of Allied Medical Professions,
Philadelphia, PA. Certificate in Physical Therapy.

1968-1971: West Chester State College, West Chester, PA. BS in Health Education.

1967-1968: The Pennsylvania State University, University Park, PA. Major: Education.

LICENSURE: Pennsylvania Physical Therapy PT 002809L
Delaware Physical Therapy J1-0000714

**ACADEMIC
POSITIONS:**

Sept., 2006-Present: Professor, Department of Physical Therapy, and Biomechanics and
Movement Science Program, University of Delaware, Newark, DE 19716

Sept., 2002-June, 2003: Acting Director, Biomechanics and Movement Science
Graduate Program, University of Delaware, Newark, DE 19716

Sept., 1995-2006: Associate Professor, Department of Physical Therapy, and
Biomechanics and Movement Science Program, University of Delaware, Newark,
DE 19716

Sept., 1988-1994: Assistant Professor, School of Life and Health Sciences, University of
Delaware, Newark, DE 19716

Sept., 1986-Sept., 1988: Assistant Professor, Department of Physical Therapy, College
of Health Sciences, Georgia State University, University Plaza, Atlanta, GA
30303

Sept., 1987-Sept., 1988: Assistant Professor, Laboratory of Behavior and Neurobiology,
Georgia State University, Atlanta, GA 30303

Sept., 1980-Aug., 1981: Assistant Professor, Program in Physical Therapy, Department of Allied Health, University of Texas Health Science Center at San Antonio, San Antonio, TX

June, 1978-Aug., 1980: Instructor, Program in Physical Therapy, Division of Allied Health and Life Sciences, The University of Texas at San Antonio, San Antonio, TX 78285

TEACHING

RESPONSIBILITIES:

PHYT 804: Neurophysiological Evaluation and Treatment.

PHYT 803: Coordinator of Medical Neurology Course

PHYT 623: Clinical Neuroscience, Motor Control Lectures

PHYT/BMSC 630: Human Movement Control

CLINICAL

POSITIONS:

Oct., 1973-Aug., 1976: Staff Physical Therapist Elizabethtown Hospital for Children and Youth, Elizabethtown, PA.

RESEARCH

POSITIONS:

Jan., 1984-Aug., 1986: Research Assistant, Office of Naval Research Grant N 00 14-83-K-0083: Functional Synergies in Voluntary Movement and Speech awarded to Haskins Laboratory, New Haven, CT. Principal Investigator: J.A. Scott Kelso, Ph.D.

Jan., 1997-Sept., 1997: Visiting Professor, Motor Control Laboratory, Department of Kinesiology, Pennsylvania State University, University Park, PA 16802: Collaborative research with Dr. Mark Latash.

INVITED

COMMENTARIES:

Fettters L, Scholz JP (2008). Upper-Extremity Movements of Infants With Brain Injuries. *Physical Therapy*, 88(9): 1034-1036

Scholz JP (1996). How functional are atypical motor patterns? *Behavioral and Brain Sciences*, 19: 85-86

Scholz JP (1991). Development of a quality-of-movement measure for children with cerebral palsy. *Physical Therapy*, 71: 829-831.

Scholz JP (1990). Quantification of control: A preliminary study of effects of neurodevelopmental treatment on reaching in children with spastic cerebral palsy. *Physical Therapy*, 70: 76-78.

Scholz JP, Turvey MT and Kelso JAS (1985). Naturalizing the context for interpreting SMA function. *The Behavioral and Brain Sciences*. 8: 598.

BOOK CHAPTERS:

Scholz JP (2010). Principles of Motor Control. In Sullivan K and Ryerson S (Eds.)
Neurologic Physical Therapy: A Process Oriented Approach to Movement Rehabilitation

MANUSCRIPTS IN PREPARATION:

Martin V, Scholz JP, Schöner G. A mathematical model of motor equivalence during four degree-of-freedom reaching tasks.

Scholz JP, Tseng YW, Dwight T, Lynch J, Schöner G. Speed induced motor equivalence and self-motion in a pointing task does not support inverse models of movement planning.

Freitas SMSF, Scholz JP. Effects of target location and arm dominance on multi-joint coordination of reaching during online corrections.

PUBLICATIONS:

1. Banala SK, Agrawal SK, Kim SH, Scholz JP (2009). Novel gait adaptation and neuro-motor training results using an Active Leg Exoskeleton (ALEX). *IEEE Transactions Neural Systems Rehabilitation Engineering*, 17(1): 2-8.
2. Kim SH, Banala S, Agrawal SK, Krishnamoorthy V, Scholz JP (2010). Gait adaptation in healthy adults using robot-assisted training. *Experimental Brain Research*, 202(4): 809-24.
3. Freitas SMSF, Scholz JP, Latash ML (2010). Analyses of joint variance related to voluntary whole-body movements performed in standing. *Journal of Neuroscience Methods*, 188(1): 89-96.
4. Freitas SMSF, Scholz JP (2010). Comparison of methods for identifying the Jacobian for uncontrolled manifold variance analysis. *Journal of Biomechanics*, 43: 775-777.
5. Gera G, Freitas SMSF, Latash ML, Monahan K, Schöner G, Scholz JP (2010) Motor abundance contributes to resolving multiple kinematic task constraints. *Motor Control*, 14: 83-115.
6. Chang Y-H, Auyang A, Scholz JP, Nichols TR (2009). Control of whole limb kinematics is referentially conserved over individual joint kinematics after peripheral nerve injury. *Journal of Experimental Biology*, 212, 3511-3521.
7. Freitas SMSF, Scholz JP (2009) Does hand dominance affect the use of motor abundance when reaching to uncertain targets? *Human Movement Science*, 28: 169-190.
8. Martin V, Scholz JP, Schöner G (2009) Redundancy, self-motion and motor control. *Neural Computation*, 21 (5): 1371-1414.
9. Tseng YW, Scholz JP, Galloway JC (2009) The organization of intralimb and interlimb synergies in response to different joint dynamics. *Experimental Brain Research*, 193: 239-254.

10. Banala SK, Kim SH, Agrawal SK, Scholz JP (2009) Robot assisted gait training with active leg exoskeleton (ALEX). *IEEE Transactions On Neural Systems and Rehabilitation Engineering*, 17(1): 2-8.
11. Krishnamoorthy V, Hsu W-L, Kesar TM, Benoit D, Banala SK, Perumal R, Sangwan V, Binder-Macleod SA, Agrawal SK and Scholz JP (2008) Gait Training following stroke: A pilot study combining a gravity-balanced orthosis device, functional electrical stimulation and visual feedback. *Journal of Neurologic Physical Therapy*, 32: 192-202.
12. Scholz JP, Kubo M (2008) Implications of Research on Motor Redundancy for Rehabilitation of Neurological Patients. *Journal of the Japanese Physical Therapy Association*, 35(8): 357-365.
13. Zhang W, Scholz JP, Zatsiorsky VM, Latash M (2008). What do synergies do? Effects of secondary constraints on multidigit synergies in accurate force-production tasks. *Journal of Neurophysiology*. 99: 500-513.
14. Agrawal SK, Banala SK, Fattah A, Sangwan V, Krishnamoorthy V, Scholz JP, Hsu W-L (2007). Assessment of motion of a swing leg and gait rehabilitation with a gravity-balancing exoskeleton. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. 15: 410-420.
15. Schöner G, Scholz JP (2007). Analyzing multi-degree-of-freedom movement systems based on variance: Uncovering structure vs. extracting correlations. *Motor Control*. 11: 258-274.
16. Latash ML, Scholz JP, Schöner G. (2007). Toward a new theory of motor synergies. *Motor Control*, 11: 275-307.
17. Hsu W-L, Scholz JP, Schöner G, Jeka J, Kiemel T (2007). Control and estimation of posture during quiet stance depends on multijoint coordination. *Journal of Neurophysiology*, 97(4): 3024-35.
18. de Freitas SMSF, Scholz JP, Stehman AJ (2007). Effect of motor planning on use of motor abundance, *Neuroscience Letters*, 417: 66-71.
19. Scholz JP, Schöner G, Hsu W-L, Jeka JJ, Horak F, Martin V (2007) Motor equivalent control of the center of mass in response to support surface perturbations, *Experimental Brain Research*, 180: 163-79.
20. Reisman D, Scholz JP (2007). Deficits in surface force production during seated reaching in people after stroke, *Physical Therapy*, 87: 326-366.
21. Krishnamoorthy V, Scholz JP, Latash, ML (2007). The use of flexible arm muscle synergies to perform an isometric stabilization task. *Clinical Neurophysiology*, 118: 525-537.
22. Yang JF, Scholz JP, Latash ML (2007). The role of kinematic redundancy in adaptation of reaching. *Experimental Brain Research*, 176: 54-69.

23. Banala SK, Agrawal SK, Fattah A, Krishnamoorthy V, Hsu WL, Scholz J, Rudolph K (2006). Gravity-balancing leg orthosis and its performance evaluation. *Robotics, IEEE Transactions on Robotics*, 22(6): 1228-1239.
24. Tseng YW, Scholz JP, Martin V (2006). Effects of movement frequency and joint kinetics on the joint coordination underlying bimanual circle drawing. *Journal of Motor Behavior*, 38: 383-404.
25. Lewek MD, Scholz JP, Rudolph KS, Snyder-Mackler L (2006). Stride-to-stride variability of knee motion in patients with knee osteoarthritis. *Gait and Posture*, 23: 505-11.
26. Hsu W-L, Krishnamoorthy V, Scholz JP (2006). Evaluation of an alternative Test of MVIC for EMG normalization in patient populations. *Muscle and Nerve*. 33(2): 232-241
27. Reisman D, Scholz JP (2006). Workspace location influences joint coordination during reaching in post-stroke hemiparesis. *Experimental Brain Research*. 170:265-76
28. Tseng Y-W, Scholz JP (2005). Unilateral vs. bilateral coordination of circle-drawing tasks. *Acta Psychologica*, 120: 172-198
29. Latash ML, Krishnamoorthy V, Scholz JP, Zatsiorsky VM. (2005). Postural synergies and their development. *Neural Plasticity*. 12(2-3): 119-30
30. Krishnamoorthy V, Yang J-F, Scholz JP (2005). Joint coordination during quiet stance: Effects of vision. *Experimental Brain Research*, 164: 1-17
31. Yang J-F and Scholz JP (2005). Learning a throwing task is associated with differential changes in the use of motor abundance. *Experimental Brain Research*, 163: 137-158.
32. Tseng Y-W, Scholz JP (2005). The effect of workspace on the use of motor abundance. *Motor Control*, 9: 75-100
33. Latash ML, Jaric S, Scholz JP, Zatsiorsky VM (2004). Motor synergies and their changes with practice. *Journal of Human Kinetics*, 12: 3-14
34. Latash ML, Danion F, Scholz JP, Schöner JP (2004). Coordination of multi-element motor systems based on motor abundance. In Latash ML, Levin MF (Eds.). *Progress in Motor Control III. Effects of Age, Disorder, and Rehabilitation*. Champaign, IL: Human Kinetics, pp. 97-124.
35. Latash ML, Jaric S, Scholz JP, Zatsiorsky V (2004). Motor synergies and their changes with practice. In Waskiewicz Z, Juras G and Raczek J (Eds.). *Current research in motor control II: Theories: Implementations and research perspectives in motor control*, University of Physical Education in Katowice, Poland, pp. 9-18
36. Jaric S, Knight CA, Scholz JP (2004). Coordination of hand grip with external load in uni- and bimanual isometric tasks. In Waskiewicz Z, Juras G and Raczek J (Eds.). *Current research in motor control II: Theories: Implementations and research perspectives in motor control*, University of Physical Education in Katowice, Poland, pp. 19-28

37. Krishnamoorthy V, Latash ML, Scholz JP, Zatsiorsky V (2004). Muscle modes during shifts of the center of pressure by standing persons: Effect of instability and additional support. *Experimental Brain Research*, 157: 18-31
38. Shinohara M, Scholz JP, Zatsiorsky VM, Latash ML. (2004). Finger interaction during accurate multi-finger force production tasks in young and elderly persons. *Experimental Brain Research*, 156:282-92
39. Reisman, D, Scholz JP (2003). Aspects of joint coordination are preserved during pointing in persons with post-stroke hemiparesis. *Brain*, 126:2510-2527
40. Krishnamoorthy V, Latash ML, Scholz JP, Zatsiorsky V (2003). Muscle synergies during shifts of the center of pressure by standing persons. *Experimental Brain Research*, 152:281–292
41. Scholz JP, Kang N, Patterson D, Latash ML (2003). Uncontrolled manifold analysis of single trials during multi-finger force production by persons with and without Down syndrome. *Experimental Brain Research*, 153(1):45-58
42. Latash ML, Scholz JP, Danion F, Zatsiorsky V, Schöner G (2003). Approaches to analysis of handwriting as a task of coordinating a redundant motor system, *Human Movement Science*, 22: 153-171
43. Tseng Y, Scholz, JP, Schöner G, Hotchkiss L (2003). Effect of accuracy constraint on the underlying joint coordination of pointing movements. *Experimental Brain Research*, 149: 276:288
44. Danion F, Schöner G, Latash ML, Li S, Scholz JP, Zatsiorsky VM (2003). A Mode hypothesis for finger interaction during multi-finger force production tasks. *Biological Cybernetics*, 88: 91-98
45. Reisman D, Scholz JP, Schöner G (2002). Differential joint coordination in the tasks of Standing up and sitting down. *Journal of Electromyography and Kinesiology*, 12: 493-505
46. Latash ML, Scholz JP, Danion F, Schöner G (2002). Finger coordination during discrete and oscillatory force production tasks. *Experimental Brain Research*, 146: 419-432
47. Tseng Y-W, Scholz JP, Schöner G (2002). Goal-equivalent joint coordination in pointing: Affect of vision and arm dominance. *Motor Control*, 6: 183-204
48. Reisman D, Scholz JP, Schöner G (2002). Coordination Underlying the Control of Whole Body Momentum during Sit-to-Stand. *Gait & Posture*, 15(1): 45-55
49. Latash ML, Scholz JP, Schöner G (2002). Motor Control Strategies Revealed in the Structure of Motor Variability. *Exercise and Sport Science Reviews*, 30: 26-31
50. Scholz JP, Danion F, Latash ML, Schöner G (2002). Understanding finger coordination through analysis of the structure of force variability. *Biological Cybernetics*, 86: 29-39

51. Latash ML, Scholz JP, Danion F, Schöner G (2001). Structure of motor variability in marginally redundant multi-finger force production tasks. *Experimental Brain Research*, 141: 153-165
52. Scholz JP, Reisman D, Schöner G (2001). Effects of Varying Task Constraints on Solutions to Joint Control in Sit-to-Stand. *Experimental Brain Research*. 141: 485-500
53. Reisman D, Scholz JP (2001). The Structure of Joint coordination underlying the control of body CM during standing up and sitting down. In Duysens, J., Bouwien, Smits-Engelsman, B.C.M. and Kingma, H. (Eds.). *Control of Posture and Gait*. ISPG2001: pp. 602-605, International Society for Postural and Gait Research, Nijmegen, Netherlands.
54. Scholz JP, Schöner G, Latash ML (2000). Motor control of pistol shooting: Identifying control variables with the uncontrolled manifold. *Experimental Brain Research*, 135(3):382-404
55. Rudolph KS, Axe MJ, Buchanan TS, Scholz JP, Snyder-Mackler L (2001). Dynamic Stability in the Anterior Cruciate Ligament Deficient Knee. *Knee Surg Sports Traumatol Arthroscopy*, 9(2): 62-71
56. Rao R, Agrawal SK, Scholz JP (2000). A Robot Test-bed for Assistance and Assessment in Physical Therapy. *Advanced Robotics*, 14(7): 565-578
57. McMillan AG, Scholz JP (2000). Early Development of Coordination for the Sit to Stand Task. *Human Movement Science*, 19: 21-57
58. Scholz JP, Schöner G (1999). The uncontrolled manifold concept: Identifying control variables for a functional task. *Experimental Brain Research*, 3: 289-306
59. Rao R, Agrawal SK, Scholz JP (1999). A Robot Test-bed for Assistance and Assessment in Physical Therapy, In *Proceedings of the International Conference on Rehabilitation Robotics*.
60. Scholz JP, Latash ML (1998). A study of a bimanual synergy associated with holding an object. *Human Movement Science*, 17: 753-779
61. Scholz JP, Brandt, C. (1997). Trajectory stability and the development of control for standing up from sitting. *Motor Control*, 1: 314-339
62. Scholz JP, Millford JP, McMillan AG (1995). Neuromuscular Coordination of Squat-Lifting. I. Effect of Load Magnitude. *Physical Therapy*, 75: 119-132
63. Scholz JP, McMillan AG (1995). Neuromuscular Coordination of Squat-Lifting. II. Individual Differences. *Physical Therapy*, 75: 133-144
64. Scholz JP (1993). Analysis of movement dysfunction: Control parameters and coordination stability. *Proceedings of the 13th Annual Eugene Michels Researcher's Forum*. Alexandria, VA: American Physical Therapy Association, pp. 3-13
65. Scholz JP (1993). Organizational principles for the coordination of lifting. *Human Movement Science*, 12: 537-576

66. Scholz JP (1993). The effect of load scaling in the coordination of manual lifting. *Human Movement Science*, 12: 427-459
67. Scholz, JP, Millford JP (1993). Accuracy and precision of the Peak Performance Technologies motion measurement system. *Journal of Motor Behavior*, 25: 2-7
68. Cummings G, Scholz JP, Barnes K (1993). The effect of imposed leg-length difference on pelvic bone symmetry. *Spine*, 18: 368-373
69. Scholz JP (1992). Low Back Injury and Manual Lifting: Review and New Perspective. *Physical Therapy Practice*, 1(3): 20-31
70. Scholz JP (1990). Dynamic Pattern Theory - some implications for therapeutics. *Physical Therapy*, 70: 827-843
71. Scholz JP, Kelso JAS (1990). Intentional switching between patterns of bimanual coordination depends on the intrinsic dynamics of the patterns. *Journal of Motor Behavior*, 22: 98-124
72. Scholz JP (1989). Reliability and validity of the WATSMART™ three-dimensional optoelectric motion analysis system. *Physical Therapy*, 69: 679-689
73. Scholz JP, Kelso JAS (1989). A quantitative approach to understanding the formation and change of coordinated movement patterns. *Journal of Motor Behavior*, 21: 122-144
74. Kelso JAS, Scholz JP, Schöner G (1988). Dynamics governs switching among patterns of coordination in biological movement. *Physics Letters A*, 134: 8-12
75. Thoman EB, Davis DH, Graham S, Scholz JP, et al. (1988). Infants at risk for sudden infant death syndrome (SIDS): Differential prediction for three siblings of SIDS infants. *Journal of Behavioral Medicine*, 11: 565-583
76. Scholz JP, Kelso JAS, Schöner G (1987). Nonequilibrium phase transitions in coordinated biological motion: Critical slowing down and switching time. *Physics Letters A*, 123:390-394
77. Kelso JAS, Schöner G, Scholz JP, Haken H (1987). Phase-locked modes, phase transitions and component oscillators in biological motion. *Physica Scripta*, 35:79-87
78. Kelso JAS, Scholz JP, Schöner G (1986). Nonequilibrium phase transitions in coordinated biological motion: Critical fluctuations. *Physics Letters A*, 118:279-284
79. Kelso JAS, Scholz JP (1985). Cooperative phenomena in biological motion. In H Haken (Ed.), *Complex systems - Operational approaches in neurobiology, physics and computers*. Berlin: Springer-Verlag, pp. 124-149
80. Scholz JP, Campbell SK (1980). Muscle spindles and the regulation of movement. *Physical Therapy*, 60: 1416-1424

CURRENT GRANTS:

National Science Foundation; **Title:** Multijoint estimation and control of upright posture.
Period: June 15, 2010 - June 14, 2012, **Role:** Principal Investigator;
Collaborator: John Jeka, University of Maryland (**BCS-0957920**).

National Center for Research Resources (INBRE Program). **Title:** A Wearable
Exoskeleton for Functional Arm Training of Stroke Survivors, **Period:** September
2009 – August 2011, **Role:** Co-investigator with Sunil Agrawal and Jill Higginson;
(**3P20RR016472-09S4**).

National Institutes of Neurological Diseases and Stroke, Principal Investigator. **Title:**
Coordination of reaching in healthy adults and stroke. **Period:** January 1, 2005 –
December 31, 2010 (no-cost extension) (**5-NS050880-02**)

National Institutes of Health. **Title:** Robotic Exoskeletons, FES, and Biomechanics:
Treating Movement Disorders (2R01HD038582-06A1). **Role:** Investigator on this
multi-investigator grant; July 2008 – June 2012; PI: Sunil Agrawal
(**2R01HD038582-06A1**).

National Institutes of Health. Subcontractor. **Title:** Organization of a simple synergy; PI:
Mark Latash, PhD, Department of Kinesiology, The Pennsylvania State
University. **Grant Period:** February 2002-January 2010. (**2286-UD-DHHS-5032**)

PREVIOUS GRANT FUNDING:

National Institutes of Health. **Title:** FES and Biomechanics: Treating movement
disorders; Investigator on multi-departmental grant to train walking in patients
following stroke. **Period:** September 2002 – August 2008, PI: Thomas Buchanan
and Stuart Binder-Macleod (**R01HD38582-01A2**).

National Science Foundation, Behavioral Neuroscience Division, Principal Investigator.
Title: Effect of Task Constraints on Motor Control of Pointing. **Grant Period:**
September, 2000 – January 2004 (**IBN-0078127**)

National Institutes of Child Health and Human Development. **Investigator:** John P.
Scholz; **Title:** Control and coordination of standing from sitting. **Grant Period:**
September, 1998 – August, 2000. (**HD35857**)

University of Delaware Research Foundation Award. **Investigators:** John P. Scholz and
John Elias; **Title:** Aiding the Disabled: Evolving efficient control methods for
assistive robots. **Grant Period:** January, 1994 - June, 1995.

Foundation for Physical Therapy, **Principal Investigator:** John P. Scholz. **Title:** A
parametric study of movement coordination in squat lifting. **Submitted:**
September 15, 1990. **Grant Period:** May 1, 1991 - April 30, 1993.

University of Delaware Research Foundation Award. **Principal Investigator:** John P. Scholz. **Title:** Patterns of coordination in the act of lifting. **Grant Period:** January, 1989 - June, 1989.

Division of Research Resources, National Institutes of Health, through the Biomedical Research Committee, University of Delaware. **Principal Investigator:** John P. Scholz. **Title:** Principles of neuromuscular coordination: A dynamic pattern analysis of manual lifting. **Grant Period:** July, 1989 - June, 1990.

Georgia State University Research Grant #88106. **Principal Investigator:** John P. Scholz. **Title:** Patterns of coordination in the act of lifting. **Grant Period:** January 1, 1988 - June 30, 1988.

INVITED TALKS:

Motor Abundance, Self-motion and motor equivalence. 6th Annual Motor Control Summer School, Antiochian Village Conference and Retreat Center, Ligonier, PA; May 28-31, 2009

The role of motor abundance in the simultaneous control of posture and arm movements during standing. Penn State Action Club, Department of Kinesiology, Pennsylvania State University, University Park, PA; October 3, 2008.

The Implication of Research on Motor Redundancy for Rehabilitation of Neurological Patients. 43rd Annual Congress of the Japanese Physical Therapy Association. Fukuoka, Japan, May 15, 2008.

Effects of training with Active Leg Exoskeleton (ALEX) on gait adaptations in healthy persons and a stroke survivor. Jewish Rehabilitation Hospital, Montreal, CA. November 13, 2007.

Does a dual control strategy exist for the control of standing posture?. School of Physical and Occupational Therapy, McGill University, Montreal, CA. November 12, 2007.

Physical Therapy: Robotic Training. Delaware Stroke Initiative's 7th Annual Conference. Update on Stroke Prevention, Treatment and Rehabilitation. Sept. 15, 2007, Clayton Hall, University of Delaware, Newark, DE 19716

Variability in Motor Learning. Fourth Motor Control Summer School. Sponsored by the Pennsylvania State University School of Kinesiology. June 21-25, 2007, Ligonier, PA.

Reaching adaptation involves the increased use of motor redundancy. University of Connecticut PAW workshop, CESP/Department of Psychology. Friday, March 31, 2006.

Motor equivalent control of the center of mass during upright standing. University of Illinois at Chicago, Department of Physical Therapy. Thursday, April 13, 2006.

Neuroplasticity: How the brain recovers from stroke. Delaware Stroke Initiative's Stroke Education Conference. Christiana Hilton, Newark, DE, November 14, 2004.

Motor Synergies Revisited: A basis for the development and learning of motor tasks.
Keynote Address, Motor Development Research Consortium, University of Delaware, Newark, DE, November 5, 2004.

Stroke rehabilitation and new research. Stroke Management: From Prevention & Emergency response to Current Treatment and Follow-up. Sponsored by the Delaware Stroke Initiative, Wilmington, DE, October 25, 2003.

Understanding degrees of freedom in the motor system: A new look at synergies, variability and constraints. Invited workshop with Ting L., Macpherson J., Tresch M., Valero-Cuevas F., and Scholz, J.P., Neural Control of Movement, Santa Barbara, CA., April 22-27, 2003.

Exploitation of motor redundancy in the control of functional tasks. Department of Physiology, Emory University School of Medicine, Atlanta, GA, April 24, 2001.

Can the study of movement disabilities aid in understanding typical motor behavior? What's the question? 2000 NASPSPA Conference, San Diego, CA. June 8-10, 2000.

Redundancy or Abundance? Evidence for a solution to "Bernstein's Problem." Department of Physical Therapy, Sargent College, Boston University. March 31, 2000.

What can variability inform us about motor control in healthy individuals and individuals with brain damage? Department of Physical Therapy, University of Maryland School of Medicine, Baltimore MD, October 8, 1999.

The uncontrolled manifold hypothesis: Application to the coordination of a sit-to-stand task. Department of Exercise Science, University of Maryland, College Park, MD, March, 1999.

Recent advances in our understanding of motor coordination and control, Neurodevelopmental Treatment Association, Region 10, Northeast Regional Conference. Waterbury, CT, November 4-5, 1995.

Abnormal "tone" and movement deficits in brain injury: Is there a relationship?, Neurodevelopmental Treatment Association, Region 10, Northeast Regional Conference. Waterbury, CT, November 4-5, 1995.

Neuromuscular Coordination of Manual Lifting. Kinesiology Department, University of Maryland, College Park, MD. Sept. 24, 1993.

Analysis of movement dysfunction: Control parameters and coordination stability. 13th Annual Eugene Michels Researcher's Forum, American Physical Therapy Association Combined Sections Meeting, San Antonio, TX. Feb. 5, 1993.

Dynamical Systems Theory: Relevance for Evaluation and Treatment. 1992 Annual Conference of the American Physical Therapy Association, Denver, CO. June 17, 1992.

Dynamic Pattern Theory: Implications for Therapy. Neurodevelopmental Treatment Association (NDTA) Instructors Group Meeting, Galilee, RI. June 6-7, 1990.

Coordination of Complex Motor Tasks. Sergeant College, Boston University. Feb. 26, 1990

Implications of a dynamic theory of motor control and coordination for rehabilitation. Conference on Movement Disorders. Boston University, Boston, MA. May 23, 1986.

SCIENTIFIC PRESENTATIONS:

1. Reimann H, Scholz JP, Schöner G. Exploiting redundancy for maintaining upright posture – a model of human posture. Neural Control of Movement, Naples, FL, April 20-25, 2010.
2. Gera G, Freitas S, Latash ML, Scholz JP. The control of hand position and hand-target orientation during reaching. Annual Meeting of the Society for Neuroscience, Chicago, IL, October 18, 2009; Abstract #355.9
3. Scholz JP, Kim SH, Srivastava S, Brackbill EA, Banala SK, Agrawal SK. Robot assisted gait training following stroke. Combined Sections Meeting of the American Physical Therapy Association, February 11, 2009, Las Vegas, NV.
4. Hsu W-L, Scholz JP. The role of motor redundancy in multi-task performance while standing. Combined Sections Meeting of the American Physical Therapy Association, February 11, 2009, Las Vegas, NV.
5. Hsu W-L, Schöner G, Scholz JP. Motor redundancy facilitates multi-task performance. Annual Meeting of the Society for Neuroscience, Washington, DC, November 16, 2008; Abstract #275.5/JJ20
6. Gera G, Freitas SMSF, Monahan K, Latash M, Scholz JP. The use of motor abundance to resolve multiple task constraints simultaneously. Annual Meeting of the Society for Neuroscience, Washington, DC, November 17, 2008; Abstract #466.17/KK24
7. Kim S-H, Brackbill EA, Banala SK, Agrawal S, Scholz JP. Efficacy of visual and proprioceptive feedback in robot-assisted gait training. Annual Meeting of the Society for Neuroscience, Washington, DC, November 18, 2008; Abstract #579.12/QQ38
8. Freitas SMSF, Schöner G, Scholz JP. Learning new patterns of joint coordination requires joint space decoupling. Annual Meeting of the Society for Neuroscience, Washington, DC, November 18, 2008; Abstract #579.11/QQ37
9. Kim S-H, Banala SK, Agrawal SK, Scholz JP. Robot-Assisted Gait Training Following Stroke. International Stroke Conference 2008, February 20-22, New Orleans, LA. Abstract # 3748
10. Krishnamoorthy V, Hsu W-L, Scholz JP, Kesar TM, Benoit DL, Perumal R, Binder-Macleod S, Banala SK, Sangwan V, Agrawal SK. Gait Training following stroke: A pilot study combining a gravity-balanced orthotic device, functional electrical stimulation and visual feedback, CSM2008 (Combined Sections Meeting of the American Physical

Therapy Association), February 9, 2008; Nashville, TN.

11. Freitas SMSF, Scholz JP. Selective use of motor abundance in persons with left and right post-stroke hemiparesis. Annual meeting of the Society for Neuroscience, San Diego, CA, November 3-8, 2007, Abstract #623.8
12. Scholz JP, Kim S-H, Banala S, Agrawal SK. Alteration of the walking pattern of healthy subjects following robotic training. Annual meeting of the Society for Neuroscience, San Diego, CA, November 3-8, 2007, Abstract #82.25
13. Scholz JP, Hsu W-L, Schöner G, Jeka JJ, Kiemel T. Control and estimation of posture during quiet stance depend on multijoint coordination. 18th International Society for Posture and Gait Meeting, Burlington, VT, August 14-18, 2007.
14. Freitas SMSF, Scholz JP, Stehman AJ. Does Movement Planning Influence the Use of Motor Abundance In Reaching? Progress in Motor Control VI, Santos, Brazil. August 9-12, 2007.
15. Krishnamoorthy V, Hsu W-L, Scholz JP, Banala SK, Agrawal SK (2006). Evaluation of a gravity-balanced orthosis for improving gait after stroke. Society for Neuroscience Meeting, Atlanta, GA Abstract #743.6
16. Kubo M, Freitas S, Scholz JP (2006). Target errors in interception in patients with post-stroke hemiparesis. Society for Neuroscience Meeting, Atlanta, GA Abstract #743.4
17. Hsu W-L, Scholz JP, Schöner G, Jeka JJ (2006). Multi-joint coordination underlies control and estimation of CM during quiet stance. Society for Neuroscience Meeting, Atlanta, GA #353.14
18. Benoit D, Krishnamoorthy V, Banal S, Hsu W-L, Perumal R, Scholz JP, Agrawal S, Binder-Macleod S, Buchanan T. An integrated approach for improving gait in a stroke population: combining robotics, FES and neuromuscular modeling. 30th Annual Meeting of the American Society of Biomechanics, September 2006, Blacksburg, VA.
19. Tseng YW, Scholz JP. Arm dynamics and motor redundancy underlying the coordination of circle-drawing. Accepted for 35th Annual Meeting of the Society for Neuroscience, Neuroscience 2005, Washington, DC, November 12-16, 2005.
20. Tseng YW, Scholz JP. Effect of movement dynamics on joint coordination underlying the control of an bimanual elliptical-drawing task. Accepted for Progress in Motor Control V: Pennsylvania State University. University Park, PA. August 17-20, 2005.
21. Krishnamoorthy V, Scholz JP, Latash ML. Muscle synergies in the upper extremity during stabilization of balance in sitting. Accepted for Progress in Motor Control V: Pennsylvania State University. University Park, PA. August 17-20, 2005.
22. Martin V, Scholz JP, Schöner G. A theoretical account for the uncontrolled manifold and motor equivalence in pointing movements. Progress in Motor Control V: Pennsylvania State University. University Park, PA. August 17-20, 2005.

23. Krisnamoorthy V, Scholz JP, Yang J-F. Joint coordination during quiet stance: effects of vision. Program No. 306.1. *2004 Abstract Viewer and Itinerary Planner*. Washington, DC: Society for Neuroscience, 2004. Online. 34th Annual Meeting of the Society for Neuroscience, San Diego, CA, October 23-27, 2004.
24. Martin V, Scholz JP, Schöner G. Theory of the uncontrolled manifold: variance, self-motion, and neuronal noise. Program No. 871.17. *2004 Abstract Viewer and Itinerary Planner*. Washington, DC: Society for Neuroscience, 2004. Online. 34th Annual Meeting of the Society for Neuroscience, San Diego, CA, October 23-27, 2004.
25. Tseng Y-W, Scholz JP. Use of motor abundance to control unimanual vs bimanual circle drawing. Program No. 871.18. *2004 Abstract Viewer and Itinerary Planner*. Washington, DC: Society for Neuroscience, 2004. Online. 34th Annual Meeting of the Society for Neuroscience, San Diego, CA, October 23-27, 2004.
26. Scholz JP, Hsu W, Schöner G, Jeka J, Horak F. Motor equivalent postural responses revealed by the UCM approach. Program No. 873.5. *2004 Abstract Viewer and Itinerary Planner*. Washington, DC: Society for Neuroscience, 2004. Online. 34th Annual Meeting of the Society for Neuroscience, San Diego, CA, October 23-27, 2004.
27. Scholz JP, Dwight T, Lynch J, Tseng Y, Schöner G. Effect of movement speed on joint coordination in 3D reaching. *2004 NASPSPA Conference*, Vancouver, CA. June 2004.
28. Reisman D, Scholz JP. The influence of workspace location on the kinematics of seated reaching in persons with hemiparesis. *2004 NASPSPA Conference*, Vancouver, CA. June 2004.
29. Chang Y-H, Scholz J.P. and Nichols T.R. Hindlimb coordination during cat locomotion after loss of stretch reflexes. Society for Integrative and Comparative Biology Meeting, New Orleans, LA, January 4-8, 2004.
30. Martin V., Schöner G. and Scholz, J.P. A dynamical model of the uncontrolled manifold (UCM). 33rd Annual Meeting, Society for Neuroscience, New Orleans, LA, November 8-12, 2003.
31. Krishnamoorthy V., Goodman S.R., Latash M.L., Scholz, J.P. and Zatsiorsky V.M. Multi-muscle synergies in postural tasks. 33rd Annual Meeting, Society for Neuroscience, New Orleans, LA, November 8-12, 2003.
32. Tseng Y-W. and Scholz J.P. The effect of workspace on motor abundance. Progress in Motor Control IV, Caen, France, August 20-23, 2003.
33. Yang, J-F. and Scholz J.P. Changes in motor abundance related to learning a Frisbee throwing task. Progress in Motor Control IV, Caen, France, August 20-23, 2003.
34. Chang Y-H, Scholz J.P. and Nichols T.R. Hindlimb coordination during cat locomotion. Neural Control of Movement, Santa Barbara, CA, April 22-27, 2003.
35. Reisman D.S. and Scholz J.P. Coordination of reaching involving the trunk in persons with hemiparesis. Combined Sections Meeting, American Physical Therapy Association, Tampa, FL, February 2003.

36. Scholz J.P. Exploring stability in the context of postural control (Invited symposium on postural control). 2002 NASPSPA Conference, Baltimore, MD, June 6-8, 2002.
37. Yang J-F. and Scholz J.P. Changes in Motor Abundance Underlying the Learning of Coordination Patterns for a Frisbee Throw. Mid-Atlantic Motor Behavior Meeting, Newark, DE, April 13, 2002.
38. Tseng Y. and Scholz J.P. Effect of index of task difficult on the use of goal-equivalent joint combinations in a pointing task. Mid-Atlantic Motor Behavior Meeting, Newark, DE, April 13, 2002.
39. Reisman D. and Scholz J.P. Differences in coordination of joint motion timing in persons with hemiparesis and healthy persons during a seated reaching task. Combined Sections Meeting, American Physical Therapy Association, Boston, MA, February 22, 2002.
40. Tseng Y., Scholz J.P. and Schöner G. Joint coordination for control of pointing movements to different sized targets. 31st Annual Meeting, Society for Neuroscience, San Diego, CA, November 10-15, 2001.
41. Scholz J.P., Reisman D. and Schöner G. Coordination of pointing movements in patients following stroke. 31st Annual Meeting, Society for Neuroscience, San Diego, CA, November 10-15, 2001.
42. Scholz, J.P., Latash ML, Danion, F. and Schöner G Central control strategies revealed through an analysis of the structure of finger force variability under stable and unstable conditions. Progress in Motor Control III. Montreal, Canada. August 16-18, 2001
43. Danion F., Latash M.L., Sheng L., Scholz J.P., Schöner G., and Zatsiorsky V.M. A model for finger interaction during maximal force production tasks. Progress in Motor Control III. Montreal, Canada. August 16-18, 2001.
44. Tseng Y., Reisman D., Yang J-F, Schöner G. and Scholz J.P. Joint coordination underlying the control of a pointing task with and without vision. Progress in Motor Control III, Montreal, Canada, August 15-18, 2001
45. Reisman D., Yang J-F, Tseng Y., Schöner G. and Scholz J.P. Joint coordination underlying the control of a pointing task in healthy and hemiplegic persons. Progress in Motor Control III, Montreal, Canada, August 15-18, 2001.
46. Reisman D and Scholz, J.P. The Structure of Joint Coordination underlying the Control of Body CM during Standing up and Sitting Down. ISPG 2001: Symposium of the International Society for Postural and Gait Research. Maastricht, Netherlands. June 23-27, 2001.
47. Reisman D and Scholz, J.P. Effects of Varying Perceptual Information on the Control of Body Momentum in a Sit to Stand Task. 2001 Combined Sections Meeting of the American Physical Therapy Association. San Antonio, TX. February 14-18, 2001.

48. Latash, M.L., Danion F., Scholz, J.P., Schöner G Abstract 3676: Finger coordination in force production tasks and the structure of motor variability. Society for Neuroscience 30th Annual Meeting. November, 2000, New Orleans, LA
49. Scholz, J.P. and Reisman D Effect of Task Constraints on Coordination of Sit-to-Stand. 2000 Combined Sections Meeting of the American Physical Therapy Association. New Orleans, LA. February 2-6, 2000.
50. Scholz, J.P., Schöner G and Latash ML Identifying Essential Control Variables: A test of the Uncontrolled Manifold Concept. Progress in Motor Control-II: Structure-Function Relations in Voluntary Movement. Pennsylvania State University, University Park, PA. August 19-20, 1999.
51. Rao, R., Agrawal, S.K., and Scholz, J.P., A Robot Test-bed for Assistance and Assessment in Physical Therapy, International Conference on Rehabilitation Robotics, Stanford University, June 1999.
52. Schöner G and Scholz, J.P. Controlling some degrees of freedom more than others. Jacques Monod Conference on Plasticity and Adaptation in Motor Control, Assouis, France. September 19-24, 1998; Organizers: Drs. Jean Massion and Hans Hultborn.
53. Scholz, J.P. and Latash ML Alteration of a bimanual synergy for object support in patients with hemiplegia. Society for Neuroscience 28th Annual Meeting. November 7-12, 1998, Los Angeles, CA.
54. McMillan, A.G. and Scholz, J.P. Changes in coordination of a sit-to-stand task across development and seat height. Combined Sections Meeting of the American Physical Therapy Association. February, 1998, Boston, MA.
55. Scholz, J.P. The development of coordination dynamics for a functional motor task: Standing from sitting. Multisegmental Motor Control: Interface of Biomechanical, Neural and Behavioral Approaches. New Hampton School, New Hampton, NH. August 13-18, 1995.
56. McMillan, A.G. and Scholz, J.P. Changes in coordination of a sit to stand task across development and seat height. World Confederation of Physical Therapy Congress. Convention Center, Washington, DC. June 25-30, 1995.
57. Millford, J.P. and Scholz, J.P. Bimanual coordination deficits in Parkinson's Disease. World Confederation of Physical Therapy Congress. Convention Center, Washington, DC. June 25-30, 1995.
58. Scholz, J.P. and McMillan, A.G. Developing coordination for rising from sitting. Motor Development Research Consortium, Annual Meeting. University of Maryland, Baltimore, MD. Oct. 21-22, 1994.
59. Scholz, J.P. and Millford, J.P. Dynamics of bimanual coordination in patients with Parkinson's Disease. Fourth Annual Conference of the Society for Chaos Theory in Psychology and the Life Sciences. Johns Hopkins University, Baltimore, MD. June 24-27, 1994.

60. Scholz, J.P. Electromyographic and kinematic indicators of the coordination of a lifting task. 23rd Annual Meeting of the Society for Neuroscience. Washington, DC. Nov. 7-12, 1993.
61. Millford, J.P. and Scholz, J.P. Electromyographic evidence for changes in the coordination of a leg-lifting task in response to increasing loads. 68th Annual Conference of the American Physical Therapy Association. Cincinnati, OH. June 12-16, 1993.
62. Scholz JP A dynamic pattern approach to understanding the coordination of manual squat lifting. Spring Meeting, International Society for Ecological Psychology. Seton Hall University, South Orange, NJ. May 23, 1992.
63. Scholz JP Dynamic joint stiffness varies systematically with the pattern of bimanual coordination during the same motor task. Annual Meeting of the Society for Neuroscience. Phoenix, AZ. October 29-November 3, 1989.
64. Scholz JP Kelso JAS and Schöner G (1987). The phase transition character of switching between rhythmic patterns of human bimanual coordination: test of a dynamical model. Neuroscience Abstracts. 13(2):824. Annual Meeting of the Society for Neuroscience. New Orleans, LA. Nov. 17-21, 1987.
65. Scholz JP A dynamic approach to motor control and coordination: Implications for therapeutics. Annual Conference of the American Physical Therapy Association. San Antonio, TX. June 28-July 2, 1987.
66. Scholz JP Transitions in patterns of bimanual coordination. Annual Meeting of the International Society of Ecological Psychology. Atlanta, GA. May 22-23, 1987.
67. Kelso JAS, Schöner G, Scholz JP and Haken, H. Nonequilibrium phase transitions in multi-degree of freedom movements. Annual Meeting of the Society for Neuroscience. Washington, DC. Nov. 9-14, 1986.
68. Kelso JAS, Schöner G and Scholz JP Phase-locked modes, phase transitions and component oscillators in biological motion. Conference on The Physics of Structure and Complexity, International Center for Theoretical Physics. Trieste, Italy. Sept. 1-5, 1986.
69. Kelso JAS, Schöner G, Scholz JP and Haken, H. Nonequilibrium phase transitions in coordinated movements involving many degrees of freedom. Conference on Perspectives in Biological Dynamics and Theoretical Medicine. National Institute of Mental Health, Bethesda, MD. April 9-11, 1986.

CURRENT ADVISEES:

Pei-Chun Kao, PhD, Post-doctoral Fellow, 2009-Present, Primary Advisor.

Eunse Park, MS, PT, Doctoral student, Sept. 2008 – Present, Primary Advisor.

Geetanjali Gera, PT, Doctoral Student, Spring 2008-Present, Primary Advisor.

Shraddha Srivastava, MS, PT, Doctoral Student, 2007-Present, Primary Advisor.

Hui-Min Lee, MS, PT, Masters Student (2005-2007), Doctoral Student, 2007-Present, MS and PhD Committee Member

Richard Willy, MS, PT, Doctoral Student, 2007-Present, PhD Committee Member

Christine Malecka, DPT, Doctoral (PhD) Student, 2007-Present, PhD Committee Member

Woe-Nan Bair, PT, Doctoral Student, 2005-Present, Dept. of Kinesiology, University of Maryland, PhD Committee Member.

PREVIOUS ADVISEES:

Sandra de Freitas, PhD, Post-doctoral Fellow, 2006-2009, Advisor.

Seok-Hun ('Huny') Kim, PhD, PT, Post-doctoral Fellow, 2006-Present, Advisor.

Paulo Barbosa de Freitas, Jr., MS, Doctoral Student, 2007-Present, Committee Member

Brian Noehren, MS, PT, Doctoral Student, 2007-Present, Committee Member.

Yuanfen Zhang, PhD, 2006-2009, Dept. of Kinesiology, University of Maryland, PhD Committee Member.

Robert Creath, PhD, 2004-2008, Dept. of Kinesiology, University of Maryland, Committee Member.

Sai Banala, PhD, Doctoral Student, ME Dept., 2005-2007, Committee Member.

Masa Kubo, PhD, PT, Post-Doctoral researcher, 2004-2006, Primary Advisor.

Vijaya Krishnamoorthy, PhD, PT, Post-doctoral Researcher, 2005-2006, Primary Advisor.

Wei-Li Hsu, PhD in Biomechanics and Movement Science, University of Delaware: "Multi-joint coordination underlies upright postural control." Spring 2008, Primary Advisor.

Jeng-Feng Yang, PhD in Biomechanics and Movement Science, University of Delaware: "Motor learning and adaptation: the role of motor abundance." Fall 2006, Primary Advisor.

Yaweng Tseng, PhD in Biomechanics and Movement Science, University of Delaware: "The use of motor abundance in controlling coordinated bimanual drawing tasks," Spring, 2005, Primary Advisor.

Valère Martin, PhD in Neuroscience, International Graduate School of Neuroscience, Ruhr Universität Bochum, Institut für Neuroinformatik, "A dynamical systems account of the uncontrolled manifold and motor equivalence in human pointing movements," Spring 2005, PhD Committee Member.

Darcy Reisman. PhD in Biomechanics and Movement Science, University of Delaware: "Coordination of kinematics and kinetics for seated reaching tasks in persons with hemiparesis." Fall 2003, Primary Advisor.

Stephen Pledge. PhD in Biomechanics and Movement Science, University of Delaware: "An integrated approach to the design of linear dynamic network-based systems. Fall 2002, PhD Committee Member.

Vijaya Krishnamoorthy, PhD in Kinesiology, Pennsylvania State University, "Muscle synergies during standing," Summer 2003, PhD Committee member

Yaweng Tseng, M.S. in Biomechanics and Movement Science, University of Delaware, "The role of motor redundancy in the control of pointing tasks," Spring 2001, Primary Advisor.

Dorsey "Blaise" Williams, Ph.D. in Biomechanics and Movement Science, University of Delaware, "Lower extremity mechanics and injury patterns in runners with pes cavus and pes planus," Spring 2000, PhD Committee member.

Edward J. Quigley, III, Ph.D. in Biomechanics and Movement Science, University of Delaware, "Predicting the rate of energy consumption while walking at a self-selected pace for children with cerebral palsy," Fall 1999, PhD Committee member.

Zhixu Guan, M.S. in Mechanical Engineering, University of Delaware, "Effects of environmental impedance on synergic muscle activity." Fall 1999, PhD Committee member.

Wayne Westerman, Ph.D. in Electrical Engineering, University of Delaware, "Development and evaluation of finger tracking, cord gesturing, and touch typing on a capacitive imaging surface." Spring 1999, PhD Committee Member.

Rahul S. Rao, M.S. in Mechanical Engineering, University of Delaware, "A robotic testbed for physical therapy." Fall 1998, PhD Committee Member.

Amy Gross McMillan, Ph.D. in Neurobiology and Neuroscience, University of Delaware, "Development of movement coordination for a sit to stand task." Summer 1998, Primary Advisor.

Katherine S. Rudolph, Ph.D. in Biomechanics and Movement Science, University of Delaware, "Dynamic stability in the anterior cruciate ligament deficient knee." Spring 1998, PhD Committee member.

PROFESSIONAL ORGANIZATIONS:

2008- Present: Society for the Neural Control of Movement.

1989-Present: Society for Neuroscience, Washington, DC.

1973-Present: American Physical Therapy Association.

2002-Present: International Society for Posture and Gait.

2000-Present: North American Society for the Psychology of Sport and Physical Activity.

1986-2004: International Society for Ecological Psychology.

April, 1972-1980: Kappa Delta Pi. (Honorary Society in Education).

**IN-SERVICE
PRESENTATIONS:**

Constraint-induced therapy. Delaware Stroke Initiative. Newark, DE. Sept. 14, 2000.

NDT: Postural Control. Kent General Hospital, Dover, DE. April 26, 2000.

**PROFESSIONAL
SERVICE:**

November 13, 2009: ZRG1 BBBP-D 03 M, Member Conflicts in Motor Function

1996-Present: Editorial Board, Motor Control.

1994-Present: Manuscript Reviewer, Journal of Motor Behavior.

2004-Present, Manuscript Reviewer, Journal of Neurophysiology.

2002-Present, Manuscript Reviewer, Experimental Brain Research.

1988-Present: Manuscript Reviewer, Physical Therapy.

June 1995-1998: Member, Research Committee of the Neurology Section, American Physical Therapy Association.

2002-2006: Secretary/Treasurer, International Society for Motor Control (ISMC).

November 2006: BBBP-E (2) Special Emphasis Panel, NIH.

April 2004: Special NIH Review panel on Rehabilitation Robotics, Washington, DC.

June 25-26, 1990: Special Review Committee (SRCD-01), National Institute of Drug Abuse, Rockville, MD. Executive Secretary: Kisinee C. Nimit, M.D., Clinical Epidemiology and Applied Sciences Review Branch.

**COMMUNITY
SERVICE:**

2000-Present: Member, Board of Directors, Delaware Stroke Initiative, 620 Stanton-Christiana Road, Suite 302, Newark, DE 19713

1999-2007: Reading tutor, HOSTS program, West Park Elementary School, Christina School District, Newark, DE.