Thomas Buchanan

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Education

Ph.D. (1986) in Theoretical & Applied Mechanics from Northwestern University, Evanston, Illinois.

M.S. (1982) in Biomedical Engineering from Northwestern University, Evanston, Illinois.

B.S. (1980) in Applied Mechanics & Engineering Sciences (Bioengineering) from the University of California, San Diego.

Professional History

7/04 to present	Chairman Department of Mechanical Engineering, University of Delaware
2/03 to 6/03	Raine Professor (visiting) School of Human Movement, University of Western Australia
9/02 to present	Professor Mechanical Engineering and Biomechanics & Movement Science, University of Delaware
9/00 to 6/04	Academic Director Biomechanics & Movement Science Program, University of Delaware
9/98 to 6/04	Director Center for Biomedical Engineering Research, University of Delaware
8/96 to 8/02	Associate Professor Mechanical Engineering and Biomechanics & Movement Science, University of Delaware
10/89 to 8/96	Associate Director Sensory Motor Performance Program, Rehabilitation Institute of Chicago
9/90 to 8/96	Assistant Professor Department of Physical Medicine & Rehabilitation, Northwestern University Medical School, and Dept. Biomedical Engineering (courtesy), McCormick School of Eng, Northwestern University
9/89 to 9/90	Research Assistant Professor Department of Rehabilitation Medicine, Northwestern University Medical School
9/86 to 9/89	Research Associate Sensory Motor Performance Program, Rehabilitation Institute of Chicago, and Department of Rehabilitation Medicine, Northwestern University Medical School

2/88 to 2/89	Post-doctoral Associate
9/86 to 9/87	Physiology Department, Northwestern University Medical School.
9/85 to 9/86	Post-doctoral Fellow Whitaker College, Department of Brain & Cognitive Sciences, Massachusetts Institute of Technology
6/81 to 8/85	Research Assistant Rehabilitation Engineering Program, Northwestern University, and Sensory Motor Performance Program, Rehabilitation Institute of Chicago.
6/79 to 8/80	Research Assistant Biochemistry Department, Scripps Clinic and Research Foundation, San Diego CA

Awards and Honors

E. A. Trabant Award for Women's Equity	University of Delaware	5/08
Innovation in Research Award	American Congress of Sports Medicine	5/08
Fellow	American Society of Mechanical Engineers	2/04
Chair: NIH Subcommittee on Function, Integration and Rehabilitation Sciences	NIH (NICHD/NCMRR)	7/05 to 6/07
Member NIH Subcommittee Function, Integration and Rehabilitation Sciences	NIH (NICHD/NCMRR)	7/03 to 7/05
Raine Professorship	Raine Medical Research Foundation/U.W. Aust	2/03 to 6/03
Provost's Merit Award	University of Delaware	2001
Dean's Merit Award	University of Delaware	1999, 00, 01, 03
Program Chair for 1999 annual meeting	American Society of Biomechanics	9/97-10/99
Falk Medical Research Scholar	Falk Trust/Rehabilitation Inst Chicago	5/93 to 9/94
NIH FIRST Award	National Institutes of Health	4/90 to 3/95
NIH Post-doctoral Trainee in Physiology	Northwestern University	2/88 to 2/89
Hearst Foundation Fellow	Rehabilitation Institute of Chicago	9/83 to 9/84
NIH Pre-doctoral Trainee in Biomed Eng	Northwestern University	12/81 to 6/82
Murphy Fellowship	Northwestern University	9/80 to 6/81

Awards to students and post-docs whose work I supervised

Peter Barrance: Student Travel Award, American Society of Biomechanics, 2001
Peter Barrance: Best Post-doctoral Paper, Biomedical Research Symposium, University of Delaware, 2005
Francis Sheehan, Ph.D: International Society of Biomechanics Post-doctoral Award, 1999
Jason J. Kutch: Morgen W. McKinzie Senior Thesis Prize, Princeton University, 2001
Glenn Williams: McMillan Scholar (Foundation for Physical Therapy), 1999
Glenn Williams: New Horizon Award (Sports Section, American Physical Therapy Association), 2000
Glenn Williams: Promotion of Doctoral Studies Scholar (Foundation for Physical Therapy), 2000, 2001, 2002
Glenn Williams: O'Donoghue Sports Injury Research Award (American Orthopaedic Society of Sports Medicine), 2002
Glenn Williams: University of Delaware Competitive Fellowship, 2002
Glenn Williams: Best Scientific Poster Presentation in the category of Sports Medicine/Arthroscopy at the 70th Annual Meeting of the American Academy of Orthopaedic Surgeons, 2002
Glenn Williams: American Society of Biomechanics Pre-doctoral Award, 2003

University Administration & Service

Administrative Posts

I am currently Chair of Mechanical Engineering at the University of Delaware. Our department has 23 tenure-track faculty members, 24 associated faculty members, 10 post-doctoral associates/visiting scholars, 12 staff members, 80 graduate students and 425 undergraduates, with an annual operating budget in excess of $4.2 million (excluding research grants). Departmental research expenditures (also over $4 million/year) have more than doubled since I became chair four years ago, as has the number of women faculty members, PhDs per faculty, and the freshmen class size. We have also undergone successful ABET review.

I was the Academic Director of the Biomechanics & Movement Science Program at the University of Delaware (BMSC) beginning in 2000. This is a multidisciplinary academic unit that gives graduate degrees. Faculty members in the BMSC program are from the departments of Mechanical Engineering, Electrical Engineering, Biological Sciences, Physical Therapy, and Health & Exercise Sciences. There were 26 faculty members and over 35 students enrolled in the BMSC doctoral program when I stepped down in 2004 to become Department Chair, a more than 50% growth from the time when I assumed the directorship. This program has been the model of interdisciplinary graduate programs at the University of Delaware.

I was also the Director of the Center for Biomedical Engineering Research (CBER) at the University of Delaware. CBER was given its name when I was appointed director in 1998. Before that time it was a called the Orthopaedic Biomechanical Engineering Center and had no external funding. CBER is an interdisciplinary center based in the Department of Mechanical Engineering, created to provide an appropriate forum and infrastructure to promote the interaction of researchers from the university and non-university community. Faculty members in CBER are from the Biomechanics & Movement Sciences Program, Mechanical Engineering, Biological Sciences, Health & Exercise Science, Computer Science, Electrical Engineering, and Physical Therapy and were 27 in number and active external research grants to CBER were in excess of $2.2 million/yr when I stepped down in 2004 to become Department Chair.

Before coming to Delaware, I was Associate Director of the Sensory Motor Performance Program (SMPP) at the Rehabilitation Institute of Chicago (9/1/89 – 8/1/96). SMPP is a research program devoted to the study of neuromuscular biomechanics and human motor control physiology. When I left there were 34 people in the program, which I co-managed on a day-to-day basis, including five faculty members and nine post-doctoral fellows with appointments at Northwestern University Medical School.

Departmental Service (Mechanical Engineering at UD)	*Title*	*Dates*
Search Committee for three new faculty members	Chairman	9/07 – present
Search Committee for new faculty member	Chairman	9/06 – 6/07
Search Committee for new faculty member	Chairman	9/05 – 6/06
Search Committee for new faculty member	Chairman	9/04 – 5/05
Search Committee for new faculty member	Chairman	5/02 – 4/04
ME Graduate Curriculum Committee	Member	6/00 – 8/04
ME Graduate Program Committee	Member	9/98 – 9/01
Search Committee for new faculty member	Member	9/00 – 5/01
ME Graduate Program Committee	Chairman	9/98 – 8/00
Search Committee for new faculty member	Chairman	6/99 – 5/00
Search Committee for new faculty member	Member	6/98 – 5/99
ME Undergraduate Honors Advisor	Advisor	9/97 – present
ME Graduate Curriculum Committee	Member	9/97 – 8/98
ME Graduate Recruitment Committee	Chairman	9/97 – 8/98
ME Undergraduate Lab Improvements Committee	Member	9/96 – 8/97
ME Computer Committee	Member	9/96 – 8/97

College/University Service at the University of Delaware

Ad hoc Bioengineering Committee	Chairman	1/08 – present
UD Task Force on Diversity	Member	2/08 – present
Research Committee for Delaware INBRE Program	Member	12/07 – present
Chairs' Caucus Steering Committee	Chairman	9/07 – present
Search Committee for Dean of Engineering	Member	9/07 – present
Center on Aging (COA) formation Committee	Member	3/07 – 7/07
Chairs Caucus Steering Committee	Member	6/05 – 6/07
Graduate Recruitment and Success Coordinating Committee	Member	12/04 – 7/06
Search Committee for Buxbaum Chair of Gerontology and Nursing Sciences	Member	8/04 – 4/05
Merit Award Nominations Committee (College of Engineering)	Member	3/02
Biomechanics & Movement Science Program	Director	9/00 – 6/04
Search Committee for Chair of Mechanical Engineering	Member	8/00 – 10/00
Evaluation Committee for 5-year review of the Director of the Biomechanics & Movement Science Program	Chairman	4/00 – 5/00
College of Engineering Strategic Planning Committee	Member	9/99 – 5/00
University of Delaware Faculty Senate	Representative	1/99 – 8/99
Colburn Award Committee (for best PhD thesis in Engineering/Mathematics at UD)	Member	5/99
IEC Bill Baron Fellowship Award Committee (for best PhD thesis in photovoltaics at UD)	Chairman	3/99
Center for Biomechanical Engineering Research	Director	9/98 – 6/04
Search Committee for Assistant Project Manager (for Vice Provost of Research)	Member	7/98 – 9/98
Dean's Advisory Council (College of Engineering)	Member	6/98 – 6/04
University of Delaware Research Committee	Chairman	6/98 – 8/99
University of Delaware Research Committee	Member	6/97 – 6/98
Institute for Transforming Undergraduate Education	Fellow	5/97 – 5/98
Science and Engineering Scholars Program	Mentor	1997, 1998, 2000
Orthopaedic Biomechanics Center	Member	9/96 – 9/98
Biomechanics & Movement Science Seminar Committee	Member	9/96 – 9/97

Other Institutional Service (prior to University of Delaware)

Research Dept. Policy & Procedure Committee, Rehabilitation Inst Chicago	Chairman	1/94 – 8/97
Medical Student Research Committee at Northwestern University	Member	9/94 – 8/97
Information Technology Task Force, Northwestern Univ. Outlook 21 Project *Subcommittee on education*	Member & *Chairman*	5/93 – 9/94
Research Committee at Rehabilitation Institute of Chicago	Member	7/92 – 8/97
Intramural Research Committee at Northwestern University	Member	6/91 – 7/94
Ad hoc committee investigating charges of scientific misconduct	Chairman	10/92

Professional Activity

Memberships (and service) in Professional Organizations

Member	American College of Sports Medicine (ACSM)	since 2002
Member	American Society of Biomechanics (ASB)	since 1989
Graduate Student Grants Committee member		8/96 – 9/97
Program Chair Elect		9/97 – 8/98
Program Chair		8/98 – 10/99
Executive Board member		9/97 – 10/99
Awards Committee member		10/99 – 7/01
Program Committee member		2003
Mentorship Program member		2005

Fellow	American Society of Mechanical Engineers (ASME)	since 2004
Member since 1985		
Member	American Society for Engineering Education (ASEE)	since 1998
Member	International Brain Research Organization (IBRO)	since 1988
Member	International Society of Biomechanics (ISB)	since 1997
Awards Committee member		2003
Awards Committee member		2005
Associate	Institute of Electrical and Electronic Engineers (IEEE)	since 1987
Member	Medical Image Computing & Computer Assisted Intervention (MICCAI)	since 2005
Member	Orthopaedic Research Society (ORS)	since 2006
Program committee (reviewer of proceedings submissions)		2006
Member	Society for Neuroscience (SFN)	since 1988

Editorial Service

J. Applied Biomechanics	Editor-in-Chief	2003-present
J. Applied Biomechanics	Associate Editor	2000-2002
J. Applied Biomechanics	Editorial Board Member	1996-1999
J. Biomechanics	Editorial Consultant	1999-present
The Open Orthopaedics Journal	Editorial Board Member	2008-present

Reviewer for the following 32 journals:

Anatomical Record
Annals of Biomedical Engineering
Archives of Physical Medicine & Rehabilitation
Biological Cybernetics
Clinical Biomechanics
Clinical Orthopaedics & Related Research
Developmental Medicine & Child Neurology
Experimental Brain Research
IEEE Transactions on Biomedical Engineering
IEEE Transactions on Robotics & Animation
IEEE Transactions on Systems, Man and Cybernetics
Journal of Applied Biomechanics
Journal of Applied Physiology
Journal of Biomechanical Engineering
Journal of Biomechanics
Journal of Experimental Biology
Journal of Motor Behavior
Journal of Neurophysiology
Journal of Neuroscience
Journal of Neuroscience Methods
Journal of Orthopaedic & Sports Physical Therapy
Journal of Physiology
Medical & Biological Engineering & Computing
Medicine & Science in Sports and Exercise
Motor Behavior
Motor Control
Muscle & Nerve
Neuroscience
Osteoarthritis and Cartilage
Physiotherapy Theory & Practice
Presence: Virtual Environments and Teleoperation
Scandinavian Journal of Rheumatology

Professional Public Service

Grant proposal reviewer	Agence Nationale de la Recherche (France)	5/08
Ad hoc member	NIH—NCRR: SEP for CTSA grant proposals	2/08
International Program Committee member	BioMech 2007, Honolulu, Hawaii	8/07
Summit of Experts in Biomechanics	US National Committee for Biomech, Keystone, CO	6/07
Member, study section	American Heart Assoc: Bioengineering & Biotech 3	4/07
Chair, Bio-Systems session	New Frontiers in Dynamic Systems Workshop (NSF)	3/07
Chair, special emphasis panel	NIH Musculoskeletal Tissue Eng Study Section	12/06
Examinateur for doctoral thesis	University of the Mediterranean, Marseille, France	11/06
Ad hoc Member, 1-day review panel for grants	NIH Biomedical Info Science & Bioeng Study Section	11/06
International Program Committee member	BioMech 2006, Palma De Mallorca, Spain	8/06
Member, 1-day review panel for grants	NIH—NIGMS (General Med Sci) SCORE/MBRS	2/06
Reviewer	NSF: Integrative Organismal Biology (Env Str Sys)	11/05
External examiner for doctoral thesis	University of Toronto	10/05
Chair of session on ankle biomechanics	Am Soc Biomech Annual Meeting, Cleveland	8/05

Member, study section	American Heart Assoc: Bioengineering & Biotech	4/05
Member, 1-day review panel for grants	NIH—NIGMS (General Med Sci) SCORE/MBRS	2/05
External examiner for doctoral thesis	University of Queensland, Australia	5/04
Member, 2-day review panel for grants	NIH—medical rehabilitation study section (MRS)	3/04
Organizer, Technical session on *Joint Biomechanics: Joint Loading Patterns and Ligament Forces*	ASME IMECE meeting, Washington, D.C.	11/03
Organizer, Technical session on *Joint Biomechanics: Dynamic Joint Stability*	ASME IMECE meeting, Washington, D.C.	11/03
External honours thesis committee member	School Biomed & Sports Sci, Edith Cowan Univ, AU	5/03
Chair, special emphasis panel	NIH NICHD— medical rehabilitation	4/03
Member, 2-day review panel for grants	NIH—medical rehabilitation research subcommittee	3/03
Member, 2-day review panel for grants	NIH—medical rehabilitation research subcommittee	10/02
Chair, special emphasis panel	NIH NICHD concept clearance reviews (prosthetics)	9/02
External examiner for doctoral thesis	University of Western Australia	7/02
External grant reviewer	Eng & Physical Sci Research Council (EPSRC), UK	7/02
Chair, special emphasis panel	NIH NICHD concept clearance reviews (rehab robots)	6/02
Member, 2-day review panel for grants	NIH—geriatric & rehabilitation study section (GRM)	6/02
Member, 1-day review panel for grants	NIH—medical rehabilitation research subcommittee	6/02
External Grant reviewer—center grants	NIH—ORWH study section (osteoarthritis research)	6/02
External Grant reviewer—SBIR grants	NIH—orthopaedic study section (ZRG1 SSS5 15B)	3/02
Member, 2-day review panel for SBIR grants	NIH—rehabilitation study section (ZRG1 SSS5 10)	3/02
Member, 2-day review panel for grants	NIH—geriatric & rehabilitation study section (GRM)	10/01
Member, 2-day review panel for SBIR grants	NIH—rehabilitation study section (ZRG1 SSS5 15)	7/01
External advisor for senior thesis	Princeton University, Mechanical Engineering Dept.	Spring/01
Reviewer of NY state development grant	New York Academy of Sciences	3/01
Member, 2-day review panel for SBIR grants	NIH—rehabilitation study section (ZRG1 SSS5 10)	3/01
Member, 2-day review panel for SBIR grants	NIH—orthopaedic study section (ZRG1 SSS5 15B)	3/01
Book Reviewer	Springer-Verlag	2/01
Reviewer of New York State research grant	New York Academy of Sciences	2/01
Member of 2-day site visit review panel	Walter Reed Army Medical Research Institute	8/00
Chair of session on biomechanical modeling	American Society of Biomechanics Annual Meeting	7/00
External Grant Reviewer	US Army Medical Research (AIBS/USAMRAA)	3/00
Program Chair for 1999 annual meeting	American Society of Biomechanics	9/97-10/99
Gave 2 hour tutorial with R. Bruce Martin on *Grant Writing: The Good, the Bad & the Ugly*	American Society of Biomechanics Annual Meeting	10/21/99
External Grant Reviewer	US Army Medical Research (AIBS/USAMRAA)	1/99
Chair of session on arm biomechanics	American Society of Biomechanics	6/97
External Grant Reviewer	Arthritis and Rheumatism Council, UK	9/97
Chair of session on multi-body dynamics	ASME Summer Bioengineering Conference	6/97
External Grant Reviewer	Medical Research Council (MRC) of Canada	5/97
External study section member	NIH—Orthopedics & Musculoskeletal Study Section	4/97
External examiner for doctoral thesis	University of Utrecht, The Netherlands	12/97
Steering committee member	Chicago Biomechanics Symposium	9/95 -9/96
Minority High School Student Research Apprentice Program	Northwestern University	6/94 – 8/94
Reviewer of Behav. Neurosci. Grant	NSF	10/93, 10/94
Ad Hoc Study Section on Rehab Medicine	NIH	9/93
External Reviewer for Rehab R&D grant	VA	7/93, 1/94
Organizer & Chair of Workshop entitled *Muscle Selection Issues: Dealing with Multiple Actuators*	Neural Control of Movement Conference Marco Island, FL	4/24/92
External Reviewer for R29 grant	NIH	6/91
External Reviewer for VPW grant	NSF	2/90
External Grant Reviewer	Medical Research Council (MRC) of Canada	5/89

Research Grants/Contracts

Summary

I have had NIH funding since 1990. As principal investigator/program director (PI or PD), I have been responsible for over $25 million of funded research (currently over $2.5 million/yr). If projects in which I have been co-PI, investigator, or mentor are included, the total figure becomes $32 million.

Principal Investigator

NIH 2R01-AR046386: ACL Injured Knee: MRI and Biomechanical Modeling. Amount: $1,642,015 from 9/15/07 to 7/31/12.

NIH 2P20-RR016458: COBRE for Women in Science & Engineering on Osteoarthritis. Amount: $10,994,464 from 6/1/07 to 5/31/12. This is a Center of Biomedical Research Excellence (COBRE) award, which I lead.

NIH R01-HD38582: FES and Biomechanics: Treating Movement Disorders. Amount: $3,091,112 from 8/7/02 to 7/31/08 (with no cost extension). This is a Biomedical Research Partnership (BRP) grant involving many investigators, which I lead.

NIH P20-RR16458: Osteoarthritis: Prevention and Treatment. Amount: $6,426,738 from 2/1/02 to 1/31/07. This was a Center Of Biomedical Research Excellence (COBRE) award, which I led.

NIH R01-AR46386: ACL Deficient Knee: MRI and Biomechanical Modeling. Amount: $966,422 from 6/1/99 to 5/31/05.

NIH R01-AR40408: Neural and biomechanical contributions to arm movement. Amount: $748,738 from 9/1/96 to 8/31/00.

University of Delaware Research Foundation: Biomechanics of the Adolescent Wrist with Juvenile Rheumatoid Arthritis. Amount: $29,554 from 6/1/97 to 5/31/99.

Arthritis Foundation Biomedical Science Grant: Joint stability in the osteoarthritic knee. Amount: $221,704 from 7/1/95 to 6/3/99.

NIH S15-NS33750: Small Instrumentation Grant. Amount: $7,813 from 9/1/94 to 8/31/95

NIH S15-AR42400: Small Instrumentation Grant. Amount: $11,654 from 9/1/93 to 8/31/94

Falk Trust: Joint Stability in the Normal and Impaired Knee. Amount: $39,060 from 5/93 to 6/94.

NIH R29-AR40408: Biomechanics of Muscle Control during Static Postures. Amount: $433,522 from 4/1/90 to 3/31/96. This was an NIH FIRST award.

BRSG award through the Rehabilitation Institute of Chicago: Biomechanical Analysis of Static Arm Postures. Amount: $9,388 from 1/90 to 3/90.

Investigator or co-PI

NIH R01-NS055383: Muscle morphology, strength and compensatory strategies following stroke. Amount: $1,640,625 from 6/1/08 to 5/30/13. Dr. J Higginson is PI on this project and I am a co-investigator

NIH R01-AR48212: Can neuromuscular training alter movement patterns? Amount: ~$1,800,000 from 2/1/05 to 11/30/09. Dr. L. Snyder-Mackler is PI on this project and I am a co-investigator

NIH R03-AR51102: Patellofemoral osteoarthritis epidemiology. Amount: $225,000 from 6/1/04 to 5/31/07. Dr. David Hunter of Boston University was PI and I was a co-investigator.

NIH 2T32-HD07490: PT/PhD Pre-doctoral training program. Amount: $250,000 from 5/1/03 to 4/30/08. Dr. S.A. Binder-Macleod is PI and I am a co-investigator on this renewal of our training grant.

NIH R01-HD37618-01: Dynamic Stability in the ACL Injured Knee. Amount: $1,077,000 from 9/1/00 to 8/31/04. Dr. L. Snyder-Mackler was PI on this project and I was a co-investigator.

NIH R03-HD35547: Kinetic and EMG patterns after ACL injury. Amount: $133,566 from 7/1/97 to 6/30/00. Dr. L. Snyder-Mackler was PI and I was an investigator on this project.

NIH T32-HD07490: PT/PhD Pre-doctoral training program. Amount: $250,000 from 9/1/96 to 5/31/01. Dr. S.A. Binder-Macleod was PI and I was a co-investigator on this training grant.

NIH R43-AR44819: A Software Aid for Diagnosis of Wrist Joint Pathology. Amount: $99,423 from 7/1/96 to 6/20/97. Dr. D. Roberts was PI and I was a co-investigator.

NIH S10-RR11856: Graphics Supercomputer to Link NIH Investigators. Amount: $160,000 from 2/1/97 to 1/31/98. Dr. S. L. Delp was PI and I was a co-investigator.

NASA NCC29001: Surgical Simulation for Limb Trauma Management. Amount: $558,696 from 6/1/94 to 5/31/96. Dr. S.L. Delp was PI and I was a co-investigator.

NIH T32-HD07418: Pathophysiology and Rehabilitation of Neural Dysfunction. Amount: $727,199 from 7/1/92 to 6/30/97. Dr. W.Z. Rymer was PI and I was a co-investigator.

NIDRR H133P20016: Engineering in Rehabilitation: A Training Program. Amount: $749,790 from 7/1/92 to 6/30/97. Dr. D.S. Childress was PI and I was a co-investigator.

NIH S10-RR07399: A Computer Workstation/Network Server to Link NIH Investigators. Amount: $113,160 from 2/1/94 to 1/31/95. Co-PI with Dr. W. Z. Rymer.

NIH R01-NS19331: Spasticity: Mechanisms and Quantification. Amount: $108,000 last fiscal year. Award dates: 4/1/83 to 11/30/90. Dr. W.Z. Rymer was PI on this grant and I was a co-investigator.

<u>Mentor</u>

NIH P20- RR016472: IDeA Network of Biomedical Research Excellence. Amount: ~$60,000/yr for this subproject from 9/30/04 to 6/30/09. Dr. D. Weir is PI on the program project grant and I was the mentor for the subproject headed by Dr. R. Rogers.

NIH F32-AR08389: Biomechanics of Juvenile Rheumatoid Arthritis. Amount: $49,300 from 10/1/95 to 9/30/97. Dr. R. Gonzalez was PI on this NRSA post-doctoral training grant.

NIH F05-TW04864: Biomechanical Mechanisms Underlying Knee Joint Stability. Amount: $24,998 from 10/1/94 to 9/30/95. Dr. D. Lloyd was PI on this Fogarty post-doctoral award for international scholars.

Invited Lectures & Tutorials (see *Peer-Reviewed Conference Proceedings* and *Abstracts from Conferences* below for additional conference presentations given)

1. *Rehabilitation and Engineering*. Speaker & panelist at the New Frontiers in Rehabilitation Research session, American Physical Therapy Association Annual Meeting, San Antonio, Texas, June 13, 2008

2. *Musculoskeletal Modeling*, Department of Mechanical Engineering, Tsinghua University, June 10, 2008

3. MRI *and biomechanical modeling of the ACL injured knee*. Department of Mechanical Engineering, Michigan State, East Lansing, MI, January 29, 2008.

4. *Neuromusculoskeletal modeling and its role in rehabilitation*. Faculty of Sports Science, University of the Mediterranean, Marseille, France, November 29, 2007

5. *How copers cope: the ACL injured knee explored using biomechanical modeling and magnetic resonance imaging*. Department of Mechanical and Aeronautical Engineering, Clarkson University, Potsdam, NY, September 28, 2007.

6. *Subject specific models of the neuromusculoskeletal system: current successes and future challenges*. Keynote address at the biannual meeting of the International Society of Biomechanics, Taipei, Taiwan, July 3, 2007.

7. *Theoretical models of FES to improve post-stroke gait*. Symposium to honor W.Z. Rymer, entitled "Quantification and Mechanisms of Impaired Motor Control," Northwestern University Medical School, Chicago, IL, June 27, 2007.

8. *University of Delaware approach to neuromusculoskeletal modeling*. SimTK Science Advisors Workshop, Department of Bioengineering, Stanford University, Palo Alto, CA, June 1, 2006.

9. *Exploring the ACL deficient knee through biomechanical modeling and magnetic resonance imaging*. Department of Exercise Science, University of Toledo, Toledo, Ohio, February 20, 2006.

10. *Using biomechanics and magnetic resonance imaging to understand the anterior cruciate ligament injured knee*. Institute for Biomaterials and Biomedical Engineering, University of Toronto, Toronto, Canada, October 4, 2005.

11. *Using cine phase-contrast MRI to study the kinematics of the ACL deficient knee*. Keynote address at workshop on non-invasive measurement of *in vivo* joint kinematics at the Annual Meeting of the Orthopaedic Research Society, Washington, DC, February 2005.

12. *Estimating muscle forces and joint moments using neuromusculoskeletal models*. Keynote address at the Musculoskeletal Modeling Symposium, American College of Sports Medicine, Indianapolis, IN, June 2, 2004.

13. *Biomechanics*. Delaware Superior Court Justices Annual Meeting, Wilmington, DE, May 6, 2004.

14. *The ACL deficient knee*. Bioengineering Department, Stanford University, Palo Alto, CA, March 8, 2004.

15. *The ACL deficient knee: an EMG and MRI study*. The Pennsylvania State University, State College, PA, January 20, 2004.

16. *How to write a successful NIH grant proposal*. Biomechanics & Movement Science Seminar, University of Delaware, September 5, 2003.

17. *The neural control of muscles in providing joint stability in orthopaedically and neurologically impaired subjects*. Australian Physiotherapy Association, Nedlands, WA, Australia, May 21, 2003.

18. *Using biomechanics and magnetic resonance imaging to understand the anterior cruciate ligament injured knee*. Raine Lecture, University of Western Australia, Perth, WA, Australia, April 11, 2003.

19. *A biomechanical approach to neuromuscular research.* Australian Neuromuscular Research Institute, Crawley, WA, Australia, March 14, 2003.

20. *Muscle force models and MRI tools for studying joint kinematics.* Delaware Biotechnology Institute, November 21, 2003.

21. *An EMG-driven biomechanical model of the human elbow: Fitting a generic model to specific subjects*. ASB Symposium on Upper Extremity Mechanics, IV World Congress Biomechanics, Calgary, August 8, 2002.

22. *Grant Writing: The Good, the Bad & the Ugly*. Biomechanics & Movement Science Seminar, University of Delaware, September 21, 2001.

23. *Biomechanics: New tools for studying orthopaedic problems.* Academy of Life Long Learning, Wilmington, DE, April 2, 2001.

24. *MRI and musculoskeletal modeling*, Electrical and Computer Engineering Department, University of Delaware, DE, December 6, 1999.

25. *Neural control of limb muscles: a biomechanical perspective*, East Carolina University, Greenville, NC, December 3, 1999.

26. *Grant Writing: The Good, the Bad & the Ugly* (2 hour tutorial with R Bruce Martin) American Society of Biomechanics Annual Meeting, Pittsburgh, PA, October 21, 1999.

27. *The control of muscles during virtual movements*. International Society of Biomechanics, Calgary, Canada, August 11, 1999.

28. *The virtual arm: a biologically-driven musculoskeletal model of the upper extremity*. ASME Summer Conference on Bioengineering, Big Sky, Montana, June 12, 1999.

29. *Biomechanics: using engineering tools to address medical problems*. LeTourneau University, February 12, 1999.

30. *Neurophysiological and Biomechanical Contributions to Knee Stability*. Biomechanics Division, School of Medicine, Johns Hopkins University, August 10, 1998.

31. *The effects of carpal malalignment on the forces in the juvenile rheumatoid arthritic wrist*. ASME Summer Conference on Bioengineering, Sun River, Oregon, June 14, 1997.

32. *Control of muscle coordination during static tasks*. Department of Kinesiology, Penn State University, State College, PA, February 29, 1997.

33. *Neurophysiological and biomechanical factors in the study of joint stability*. Department of Kinesiology, Penn State University, State College, PA, February 28, 1997.

34. *Stabilizing the knee joint*. Department of Rehabilitation Medicine, University of Pennsylvania, Philadelphia, PA, November 21, 1996.

35. *The control of varus and valgus loads at the knee: Neurophysiological and biomechanical studies*. Department of Orthopedic Surgery, Rush-Presbyterian-St. Luke's Medical Center, Chicago, IL, February 28, 1996.

36. *EMG Driven musculoskeletal models*. Department of Mechanical Engineering, University of Delaware, February 17, 1996.

37. *The maintenance of joint stability*. Conference title: Application of Basic Science to Rehabilitation. Rehabilitation Foundation, Marionjoy Rehabilitation Hospital, Wheaton, IL, December 4, 1995.

38. *Neuromuscular biomechanics research*. Department of Mechanical Engineering, University of Illinois at Chicago, September 13, 1995.

39. *Control of muscle coordination during static tasks*, Department of Exercise Science, University of Massachusetts, Amherst, May 11, 1995.

40. *Surgical simulation for limb trauma management,* Symposium on Medical Dual-Use Technologies at the IEEE Engineering in Medicine and Biology Meeting, Baltimore, MD, November 5, 1994.

41. *Single and multi-joint muscle activation and the degrees-of-freedom problem during static, isometric tasks*. Symposium on Redundancy in the Motor System at the 2nd World Congress on Biomechanics, Amsterdam, July 14, 1994.

42. *Disturbances of motor control in spasticity*. Management Strategies for Spasticity in Children and Adults Conference, Chicago, IL, May 20, 1993.

43. *An examination of muscle selection strategies during isometric contractions in the human arm*. Neural Control of Movement Conference, Marco Island, Florida, April 24, 1992.

44. *Strategies for muscle activation during isometric torque generation at the human elbow*. Department of Physical Therapy, University of Illinois at Chicago, May 18, 1990.

45. *Strategies for muscle activation during isometric torque generation at the human elbow*. Neuroscience Symposium on System Solutions to Motor Problems, Tempe, Arizona, October 28–29, 1989.

46. *Coordination of muscles during static limb postures*. Midwest Motor-Sensory Systems Symposium, Wisconsin Dells, Wisconsin, May 5–6, 1989.

47. *Control of static limb postures in humans*. Department of Bioengineering, University of Illinois at Chicago, April 25, 1989.

Teaching

Courses and Lectures at University of Delaware (UD) and Northwestern University (NU)

Spring, 2008	Advanced Biomechanics	UD MEEG 866
Spring, 2007	Introduction to Mechanical Engineering Labs (Course director/coordinator)	UD MEEG 102
Winter, 2007	Independent Study: MRI & Biomechanics (Course director/coordinator)	UD MEEG 466
Spring, 2006	Introduction to Mechanical Engineering Labs (Course director/coordinator)	UD MEEG 102
Spring, 2005	Introduction to Mechanical Engineering Labs (2 week module: *Introduction to Muscle Biomechanics*)	UD MEEG 102
Spring, 2004	Introduction to Mechanical Engineering Labs (3 week module: *Introduction to Muscle Biomechanics*)	UD MEEG 167
Spring, 2004	Biomechanics of Human Movement	UD MEEG 612
Fall, 2003	Orthopaedic Biomechanics	UD MEEG 483/683
Spring, 2002	Biomechanics of Human Movement	UD MEEG 612
Fall, 2001	Orthopaedic Biomechanics	UD MEEG 483/683
Spring, 2001	Biomechanics of Human Movement	UD MEEG 612
Fall, 2000	Orthopaedic Biomechanics	UD MEEG 483/683
Fall, 1999	Advanced Musculoskeletal Biomechanics	UD MEEG 867
Spring, 1999	Biomechanics	UD MEEG 613
Fall, 1998	Biomechanics of Human Movement	UD MEEG 667

Spring, 1998	Statics	UD MEEG 112
Spring, 1998	Mathematics of Biomechanics	UD BMSC 866
Winter, 1998	Biomechanical Analaysis of Musculoekeletal Sys.	UD MEEG 466
Fall, 1997	Statics	UD MEEG 112
Spring, 1997	Biomechanics	UD MEEG 613
3/11/97	Integrative Neuroscience: Central Motor Control	UD BISC/PSYC 667
Fall, 1996	Principles of Mechanics I (Statics)	UD MEEG 213
4/25/96	Pathophysiology: Problem-Based Learning	NU Med. School, Freshman class
3/18/96	Biomechanics and Arthritis Research	NU Rheumatology Grand Rounds
Winter, 1996	Musculoskeletal Biomechanics	NU Biomed. Engng. C62
Winter, 1996	Design of knee laxity measurement device	NU Biomed. Engng. Senior Design Project
4/28/94	Biomech. of Movement: Fwd. *v* Inv. Dynamics	NU Biomed. Engng. C66
11/94–12/94	Pathophysiology: Problem-Based Learning	NU Med. School, Freshman class
1/94–3/94	Pathophysiology: Problem-Based Learning	NU Med. School, Freshman class
Winter, 1994	Musculoskeletal Biomechanics	NU Biomed. Engng. C62
Winter, 1994	Design of an airbag for an automobile headrest	NU Biomed. Engng. Senior Design Project
5/6/93	Biomech. of Movement: Trajectory planning	NU Biomed. Engng. C95
12/10/92	Biomechanics of the Elbow	NU Rehab Med. Arthritis rounds
5/26/92	Biomech. of Movement: Trajectory planning	NU Biomed. Engng. C95
4/2/92	Biomechanics of the Knee	Rehab. Inst. of Chicago—Arthritis rounds
Spring, 1992	Knee joint stabilization (independent study)	NU Biomed. Engng. D90
Winter, 1992	Musculoskeletal Biomechanics	NU Biomed. Engng. C95
Winter, 1992	Force measuring device for stroke patients	NU Biomed. Engng. Senior Design Project
12/10/91	Basic Biomechanics of the Knee	NU Rehab. Med. residents
10/15/91	Knee Ligament Function	NU Rehab. Med. residents
6/4/91	Biomech. of Movement: Trajectory planning	NU Biomed. Engng. C95
Winter, 1991	Musculoskeletal Biomechanics	NU Biomed. Engng. C95
Winter, 1991	Muscle coordination in the arm (independent study)	NU Biomed. Engng. D90
Winter, 1991	Design of a clarinet wrist brace	NU Biomed. Engng. Senior Design Project
Fall, 1989	Neuromuscular mechanics	NU Physical Therapy D25-1
Summer, 1984	Functional Anatomy	NU Physical Therapy Dept

Advisor

Undergraduate Students for which I have served (or am serving) as research advisor:

Brian Burgess (1991), Bill Cross (1991), Dean Pelletier (1991), Dan Zimet (1991), Jennifer Fan (1992), Ann Kuenster (1992), Mark Rademacher (1992), Stephanie Shors (1992), Liz Beauchamp (1994), Karim Botros (1994), Michael Harris (1994), Jason Kalgreen (1994), Matt Kopera (1994), Chad Achenback (1995), John Miller (1995), Stephen Olson (1995), Juris Shibayama (1995), Frederick Bernstein (1995), Andrew Towle (1997), Timothy Frick (1997), David Geesaman (1997-1999), Jason Kutch (1998-2001), Dirk Veenema (2000-2002), Patrice Hughes (2002), Christine Tate (2001-2005), Tom Pepe (2002-2006), Kristen Eli (2002-2006), Benjamin Binder-Macleod (2004-2008), Laura Schultz (2006-2007)

Undergraduate Theses I have supervised:

Jason J. Kutch, Princeton University, Mechanical Engineering, 2001, "State observability of neuromuscular control systems: optimal subspace representations and EMG reconstruction" ***Winner of Morgen W. McKinzie Senior Thesis Prize, Princeton University****

Christine Tate

Master's Students for which I have served (or am serving) as advisor:

Michael Moniz, NU Biomedical Engineering, 1990, "A biomechanical analysis of individual muscle forces about the wrist joint during isometric tasks"

Wendy Murray, NU Biomedical Engineering, 1992, "Anatomical measurement and theoretical calculation of muscle moment arms at the elbow joint"

Tony Kim, NU Mechanical Engineering, 1993, "Dynamic response to medial and lateral torques applied to the human knee: a study of the neuromuscular feedback system associated with maintaining varus and valgus stability"

Anita Greerson, NU Mechanical Engineering, 1994, "Moment generating characteristics of the wrist muscles: an experimental and theoretical analysis"

David Shreeve, NU Biomedical Engineering, 1994, "An evaluation of optimization techniques for estimation of muscle forces based on EMGs during static isometric tasks"

Scott Beckman, NU Physical Therapy, 1994, "The effects of ankle inversion injury and hypermobility on hip and ankle muscle EMG onset latency"

Jason Solbeck, NU Biomedical Engineering, 1995, "Muscular resistance to varus loads at the elbow joint"

Zhixu Guan, UD Mechanical Engineering, 1999, "Effects of environmental impedance on synergic muscle activity"

Tom Koehler, UD Mechanical Engineering, 2001, "A spring model of articular cartilage"

Lynn Wang UD Mechanical Engineering, 2001, "Prediction of muscle activation from EMG signals using neural network model"

Eric Ramos, UD Mechanical Engineering, 2001, "Dynamic stability in the anterior cruciate ligament injured knee: motion analysis using a perturbation device"

Xiaopeng Lu, UD Mechanical Engineering, 2001, "Force transmission through the juvenile idiopathic arthritic wrist: a novel approach using a sliding rigid body spring model"

Richard Hiene, UD Mechanical Engineering, 2002, "Evaluation of parameter importance in the estimation muscle forces from EMG signals using Hill-type models"

Matas Smakotinas, UD Mechanical Engineering, 2004—"Evaluation of EMG-driven model predictions at low and high forces"

Shay Cohen, UD Mechanical Engineering, 2004, "A musculoskeletal biomechanical model of the ankle"

Dustyn P. Roberts, UD Biomechanics & Movement Science, 2004, "Using ultrasound to estimate muscle properties in men and women"

Daniel Bassett, Mechanical Engineering, 2007, "Multi-joint biomechanical models of gait in post-stroke patients"

Justin Cowder, UD Mechanical Engineering, 2008, "Using ultrasound to determine muscle force-generating properties"

David Olchowski, UD Mechanical Engineering, *in progress*, "Biomechanics of the ACL-repaired knee"

Doctoral Students for which I have served (or am serving) as advisor, and current positions:

Marianne Niewenhaus, University of Utrecht, Netherlands, Medicine, 1996, "The wrist in juvenile chronic arthritis"—Clinical research scientist, Martini Ziekenhuis, Groningen, Netherlands

Wendy Murray, NU Biomedical Engineering, 1997, "The functional capacity of the elbow muscles: anatomical measurements, computer modeling, and anthropometric scaling"—Assistant Professor of Biomedical Engineering, Northwestern University

Glenn N. Williams, UD Biomechanics & Movement Science, 2003, "Clinical treatment of the ACL injured knee: implications from MRI and EMG analysis" ***Winner of American Society of Biomechanics Pre-doctoral Award**—Assistant Professor of Physical Therapy and Rehabilitation Sciences, University of Iowa

Peter J. Barrance, UD Mechanical Engineering, 2004, "A method for the measurement of joint kinematics from dynamic magnetic resonance imaging data and its application to the study of the anterior cruciate ligament deficient knee"—Assistant Professor of Physical Medicine and Rehabilitation, University of Medicine and Dentistry of New Jersey

Daniel Bassett, Biomechanics & Movement Science, *in progress*, "Biomechanical modeling of gait in ACL-impaired patients"

Qi Shao, Mechanical Engineering, *in progress*, "Three dimensional EMG-driven model incorporating knee ligaments to estimate joint kinetics."

Toran MacLeod, Biomechanics & Movement Science, *in progress*, "ACL reconstructed knee mechanics."

Postdoctoral Fellows (and their current positions):

David Lloyd, Ph.D.—Senior Lecturer in Human Movement, University of Western Australia, Perth, AU

Roger Gonzalez, Ph.D.—Prof. Mech. & Biomed. Engineering, LeTourneau University, Longview, TX
Adam Rosen, M.D.—Rheumatologist in Clearwater, Florida
Marianne Nieuwenhuis, Ph.D.—Clinical research scientist, Martini Ziekenhuis, Groningen, Netherlands
Jian-Yu Cheng, Ph.D.—Senior Research Scientist at Dynaflow, Inc, Washingston D.C.
Francis Sheehan, Ph.D.—Staff Scientist, NIH and Adj. Prof. of Mechanical Engineering, Univ. of Maryland
Winner of International Society of Biomechanics Post-doctoral Award
Katherine Rudolph, Ph.D., P.T.—Assistant Professor of Physical Therapy at University of Delaware
Kurt Manal, Ph.D.— Asst. Prof., Mech. Eng. and Biomech. & Movement Sci., University of Delaware
Peter Barrance, Ph.D.—Assistant Professor, Medical College of New Jersey
Daniel Benoit, Ph.D.— Assistant Professor, University of Ottawa
Guillaume Rao, Ph.D.—Assistant Professor, University of the Mediterranean, Marseille, France

Consulting

Expert Witness

Quinn Emanuel	*Plaintiff* in Izumi v Philips	2003
Tighe, Conttrell & Logan	*Defendant* in Capobianco v Klein et al.	2002
Jacobs & Crumplar, Ltd	*Plaintiff* in Rosenzweig v IBM et al.	1998
Williams & Montgomery Ltd	*Defendant* in Reese v. Trans-States Express et al.	1996
Cohen, Weisenburger & Challos	*Plaintiff* in Gray v. Miracle Equipment et al.	1995-6
Pretzel & Stouffer	*Defendant* in Johnson v. Evanston Hospital et al.	1993

Biomechanics

LeTourneau University	Consultant on NSF funded Biomedical Engineering Program grant	2001-2006
IWW, Inc.	Consultant for biomechanics during exercise (for equipment design)	1999
Providents, Inc.	Consultant for dental imaging software	1998-1999
Anatek, Inc.	Consultant for biomechanical applications of medical imaging data	1997-1998
Northwestern Univ., Dept Rheumatology	Consultant for analysis of measurement of knee varus/valgus laxity	1997
Musculographics, Inc.	Consultant for tissue texture maps, biomechanics of traumatic injuries	1994-1996

Publications

Summary

Publications have been cited over 1,350 times. H-index ≥ 21 (i.e., at least 21 papers have been cited 21 or more times according to the Scopus database) and the average number of citations per published peer-reviewed article is over 20.

Peer-Reviewed Journal Articles

1. Buchanan TS, Shao Q: Neuromusculoskeletal models to simulate rehabilitation (submitted)

2. Shao Q, Bassett DN, Manal K, Buchanan TS: An EMG-driven model to estimate muscle forces and joint moments in stroke patients (submitted)

3. Burnett A, Netto K, Drouet N, Morris I, Lloyd D, Buchanan TS: Can estimates of neck muscle physiological cross-sectional area be made from external anthropometric measurements? (submitted)

4. Rao G, Berton E, Amarantini D, Vigouroux L, Buchanan TS: Prediction of the decrease in force generation capacity of the quadriceps muscle group in dynamic fatigued condition and implications for EMG-driven biomechanical models (in revision)

5. Shao Q, Buchanan TS: A biomechanical model to estimate corrective changes in muscle activation patterns for post-stroke patients (in revision)

6. Manal K, Roberts DP, Buchanan TS: Can pennation angles be predicted from EMGs for the primary ankle plantar and dorsiflexors during isometric contractions? *J Biomech* (in press) 2008

7. Petterson SC, Barrance PJ, Buchanan TS, Snyder-Mackler L: Mechanisms underlying quadriceps weakness in knee osteoarthritis *Med Sci Sports Excer* 40: 422-427, 2008

8. Barrance PJ, Williams GN, Snyder-Mackler L, Buchanan TS: Do ACL injured copers exhibit differences in knee kinematics? An MRI study. *Clin Orthop Rel Res* 454: 74-80, 2007

9. Manal K, Roberts DP, Buchanan TS: Optimal pennation angle of the primary ankle plantar and dorsiflexors: variations with sex, contraction intensity and limb. *J Appl Biomech* 22: 255-263, 2006

10. Binder-Macleod BI, Buchanan TS: Tibialis anterior volumes and areas in ACL injured limbs compared to unimpaired, *Med Sci Sports Excer* 38: 1553-1557, 2006

11. Tate CM, Williams GN, Barrance PJ, Buchanan TS: Lower extremity muscle morphology in young athletes: an MRI-based analysis, *Med Sci Sports Excer* 38: 122-128, 2006

12. Barrance PJ, Williams GN, Snyder-Mackler L, Buchanan TS: Altered knee kinematics in ACL deficient non-copers: a comparison using dynamic MRI, *J Orthop Res* 24: 132-140, 2006

13. Williams GN, Snyder-Mackler L, Barrance PJ, Axe MJ, Buchanan TS: Neuromuscular function after anterior cruciate ligament reconstruction with autologous semitendinosus-gracilis graft: Analysis of voluntary muscle control. *J Electromyo Kinesiol* 15: 170-180, 2005

14. Williams GN, Snyder-Mackler L, Barrance PJ, Buchanan TS: Quadriceps femoris muscle morphology and function after ACL injury: a differential response in copers versus non-copers. *J Biomech* 38: 685-693, 2005
**** ASB Pre-doctoral Young Scientist Award Paper ****

15. Williams GN, Buchanan TS, Barrance PJ, Axe MJ, Snyder-Mackler L: Quadriceps weakness, atrophy and activation failure in non-copers after anterior cruciate ligament injury. *Am J Sports Med* 33(3): 402-407, 2005

16. Hunter DJ, Niu J, Zhang Y, Nevitt MC, Xu L, Liu L, Yu W, Aliabadi P, Buchanan TS, Felson DT . Knee height, knee pain and knee osteoarthritis. The Beijing Osteoarthritis Study. *Arthritis & Rheum* 52(5): 1418-1423, 2005

17. Lloyd DG, Buchanan TS, Besier TF: Neuromuscular biomechanical modeling to understand knee ligament loading in static and dynamic tasks. *Med Sci Sports Excer* 37(11):1939-1947, 2005

18. Barrance PJ, Williams GN, Novotny JE, Buchanan TS: A method for measurement of joint kinematics *in vivo* by registration of 3D geometric models with cine phase contrast magnetic resonance imaging data. *J Biomech Eng* 127(5): 829-837, 2005

19. Manal K, Buchanan TS: Use of an EMG-driven biomechanical model to study virtual injuries. *Med Sci Sports Excer* 37(11):1917-1923, 2005

20. Buchanan TS, Lloyd DG, Manal K, Besier TF: Estimation of muscle forces and joint moments using a forward-inverse dynamics model, *Med Sci Sports Excer* 37(11):1911-1916, 2005

21. Williams DS, Davis I, Scholz JP, Hamill J, Buchanan TS: High-arched runners exhibit increased leg stiffness compared to low-arched runners. *Gait & Posture* 19(3): 263-269, 2004

22. Manal K, Buchanan TS: Subject specific estimates of tendon slack length: a numerical method. *J Appl Biomech* 20(2): 195-203, 2004

23. Williams GN, Barrance PJ, Snyder-Mackler L, Buchanan TS: Altered quadriceps muscle control in people with anterior cruciate ligament deficiency. *Med Sci Sports Excer* 36(7): 1089-1097, 2004

24. Williams GN, Snyder-Mackler L, Barrance PJ, Axe MJ, Buchanan TS: Neuromuscular function after anterior cruciate ligament reconstruction with autologous semitendinosus-gracilis graft: Analysis of muscle and tendon morphology with magnetic resonance imaging. *J Bone Joint Surg* 86-A(9): 1936-1946, 2004

25. Buchanan TS, Lloyd DG, Manal K, Besier TF: Neuromusculoskeletal Modeling: Estimation of muscle forces and joint moments and movements from measurements of neural command, *J Appl Biomech* 20(4): 367-395, 2004

26. Heine R, Manal K, Buchanan TS: Using Hill-type muscle models and EMG data in a forward dynamic analysis of joint moment: evaluation of critical parameters. *J Mech Med Biol* 3(2): 169-186, 2003

27. Manal K, Buchanan TS: A one-parameter neural activation to muscle activation model: Estimating isometric joint moments from electromyograms. *J Biomech* 36(8): 1197-1202, 2003

28. Williams GN, Barrance PJ, Snyder-Mackler L, Axe M, Buchanan TS: Specificity of muscle action after anterior cruciate ligament injury. *J Orthop Res* 21(6): 1131-1137, 2003

29. Murray WM, Buchanan TS, Delp SL: Scaling of peak moment arms of elbow muscles with dimensions of the upper extremity. *J Biomech* 35(1): 18-22, 2002

30. Manal K, Lu X, Nieuwenhuis MK, Helders PJM, Buchanan TS: Force transmission through the juvenile idiopathic arthritic wrist: a novel approach using a sliding rigid body spring model., *J Biomech* 35(1): 125-134, 2002 **** Selected for reprint in abstract form in*** **Calcium and Calcified Tissue Abstracts** ***database by CSA ****

31. Manal K, Gonzalez RV, Lloyd DG, Buchanan TS: A real-time EMG driven virtual arm, *Comp Biol Med* 32(1): 25-36, 2002

32. Wang L, Buchanan TS: Prediction of joint moments using a neural network model of muscle activations from EMG signals, *IEEE Trans Neural Systems & Rehab Engineering*, 10(1): 30-37, 2002

33. Rudolph KS, Axe M, Buchanan TS, Scholz J, Snyder-Mackler L: Dynamic stability in the anterior cruciate ligament deficient knee *Knee Surg Sports Tramatol Arthrosc*, 9: 62-71, 2001

34. Williams DS, McClay IS, Hamill J, Buchanan TS: Lower extremity kinematic and kinetic differences in runners with high and low arches, *J App Biomech* 17: 153-163, 2001

35. Lloyd DG, Buchanan TS: Strategies of the muscular contributions to the support of varus and valgus loads at the human knee, *J Biomech* 34: 1257-1267, 2001.

36. Kutch JJ, Buchanan TS: Human elbow torque is linearly encoded in EMG signals from multiple muscles, *Neurosci Lett* 311: 97-100, 2001 **** Selected for reprint in abstract form in*** **Calcium and Calcified Tissue Abstracts** ***database by CSA ****

37. Nieuwenhuis M, Gonzalez RV, van der Net J, Kuis W, Beek FJA, Buchanan TS, and Helders PJM: The role of forearm muscles related to wrist malalignment in juvenile chronic arthritis. *Adv Physiotherapy* 3(3), 108-119, 2001

38. Williams G, Chmielewski T, Rudolph K, Buchanan TS, Snyder-Mackler L: Dynamic knee stability: current theory and implications for clinicians and scientists, *J Orthop & Sports Phys Therapy* 31(10):546-566, 2001

39. Murray WM, Buchanan TS, Delp SL: The isometric functional capacity of elbow muscles *J Biomech* 33: 943-952, 2000

40. Helders PJM, Nieuwenhuis MK, van der Net J, Kramer PPG, Kuis W and Buchanan TS: Displacement response of juvenile arthritic wrists during grasp. *Arthritis Care & Research* 13: 375-381, 2000

41. Sharma L, Hayes KW, Felson DT, Buchanan TS, Kirwan-Mellis G, Lou C, Pai Y-C: Does laxity alter the relationship between strength and physical function in knee osteoarthritis? *Arthritis & Rheum* 42:25-32, 1999

42. Sharma L, Lou C, Felson DT, Kirwan-Mellis G, Dunlop DD, Hayes KW, Weinrach D, Buchanan TS: Laxity in healthy and osteoarthritic knees *Arthritis & Rheum* 42: 861-870, 1999

43. Gonzalez RV, Abraham LD, Barr RE, Buchanan TS: Muscle coordination in ballistic isolated and combined movements about the human elbow joint complex, *Biol Cybernetics* 80: 357-367, 1999

44. Nieuwenhuis M, van der Net J, Kuis W, Buchanan TS, and Helders PJM: Assessment of wrist malalignment in juvenile rheumatoid arthritis. *Adv Physiotherapy* 1: 99-109, 1999

45. Murray WM, Arnold AS, Salinas S, Durbhakula MM, Buchanan TS, Delp SL: Building biomechanical models based on medical image data: An assessment of model accuracy. *Lectures Notes in Computer Science.* 1496: 539-549, 1998

46. Buchanan TS, Delp SL, Solbeck JA: Muscular resistance to varus and valgus loads at the elbow. *J Biomech. Engng* 120: 634-639, 1998

47. Buchanan TS, Lloyd DG: Muscle activation at the human knee during isometric flexion-extension and varus-valgus loads, *J Orthop Res* 15:11-17, 1997

48. Gonzalez RV, Buchanan TS, Delp SL: How muscle architecture and moment arms affect wrist flexion-extenion moments, *J Biomech* 30:705-712, 1997

49. Buchanan TS, Erickson JC: Selective blockade of the brachialis motor point: an anatomical investigation of musculocutaneous nerve branching, *Reg Anesth* 21: 89-92, 1996

50. Buchanan TS, Kim AW, Lloyd DG: Selective muscle activation following rapid varus/valgus moments at the human knee, *Med Sci Sports Excer* 28: 870-876, 1996

51. Lloyd DG, Buchanan TS: A model of load sharing between muscles and soft tissues at the human knee during static tasks, *J Biomech Engng* 118:367-376, 1996

52. Delp SL, Grierson AE, Buchanan TS: Maximum isometric flexion-extension and radial-ulnar deviation moments generated by the muscles about the wrist joint, *J Biomech* 29:1371-1376, 1996

53. Buchanan TS, Shreeve DA: An evaluation of optimization techniques for the prediction of muscle activation patterns during static isometric tasks, *J Biomech Engng* 118:565-574, 1996

54. Murray W, Delp SL, Buchanan TS: Variation of muscle moment arms with elbow and forearm position, *J Biomech* 28: 513-525, 1995

55. Dewald JPA, Pope PS, Given JD, Buchanan TS, Rymer WZ: Abnormal muscle coactivation patterns during isometric force generation at the elbow and shoulder in hemiparetic stroke subjects, *Brain* 118:495-510, 1995

56. Kim AW, Rosen AM, Brander VA, Buchanan TS: Selective muscle activation following electrical stimulation of the collateral ligaments of the human knee, *Archives Phys Med Rehab* 76: 750-757, 1995

57. Buchanan, TS: Evidence that maximum muscle stress is not a constant: differences in specific tension between elbow flexors and extensors, *Med Eng Physics* 17:529-536, 1995.

58. Buchanan TS, Lloyd DG: Muscle activity is different for humans performing static tasks which require force control and position control, *Neurosci Lett* 194:61-64, 1995

59. Beckman SM, Buchanan TS: The effects of ankle inversion injury and hypermobility on hip and ankle muscle EMG onset latency, *Archives Phys Med Rehab* 76:1138-1143, 1995

60. Buchanan TS, Moniz MJ, Dewald JPA, Rymer WZ: Estimation of muscle forces about the wrist joint during isometric tasks using an EMG coefficient method, *J Biomech* 26: 547-560, 1993
**** Selected for reprint in abstract form in* Year Book of Sports Medicine *by Mosby, 1994 ****

61. Buchanan TS, Rovai GP, Rymer WZ: Strategies for human muscle co-activation during static multijoint postures of varying loads and joint angles, *J Neurophysiol* 62: 1201-1212, 1989

62. Lee WA, Buchanan TS, Rogers MW: Effect of arm accelerations and response conditions on the organization of postural adjustments during voluntary movement in standing humans, *Exp Brain Res* 66:257-270, 1987

63. Buchanan TS, Almdale DPJ, Lewis JL, Rymer WZ: Characteristics of synergic relations during isometric contractions of human elbow muscles, *J Neurophysiol* 56:1225-1241, 1986

Miscellaneous Publications in Peer-reviewed Journals (Short publications, Editorials, Letters, Abstracts)

64. Buchanan TS, Manal K: *In vivo* estimation of compressive loads in the ACL-reconstructed knee. *Med Sci Sports Ex*, 40: (in press), 2008 **** Innovation in Research Award from the American Congress of Sports Medicine ****

65. Buchanan TS: Subject specific models of the neuromusculoskeletal system: current successes and future challenges. *J Biomech*, 40(S2): S20, 2007

66. Shao Q, Bassett DN, Manal K, Buchanan TS: Modeling FES protocols for correcting joint moments in post-stroke subjects. *J Biomech*, 40(S2): S219, 2007

67. Buchanan TS, Shao Q, Bassett DL, Benoit DL, Manal K: Neuromusculoskeletal models to simulate rehabilitation of the injured ankle. *Med Sci Sports Ex*, 39: S50, 2007

68. Barrance PJ, Benoit DL, Buchanan TS: MRI-based modeling of changes in knee positioning and cartilage contact related to injury and weightbearing. *J Biomech*, 39: S502, 2006

69. Benoit DL, Barrance PJ, Manal K, Buchanan TS: Anterior cruciate ligament repair technique alters knee joint forces during isometric flexion-extension. *J Biomech*, 39: S545, 2006

70. Bassett DN, Manal K, Cohen S, Buchanan TS: Predicting ankle joint moments using a hybrid EMG-driven model. *Med Sci Sports Ex,* 37(5S), 1432, 2005

71. Tate CM, Williams GN, Barrance PJ, Buchanan TS: Evaluation of subject specific lower limb muscle morphology in young athletes using magnetic resonance imaging. *Med Sci Sports Ex* 51: 2344, 2004

72. Buchanan TS: Editorial—Special issue on biomechanical modeling, *J Appl Biomech* 20(4): 335, 2004

73. Manal K and Buchanan TS: EMG-Driven Estimates of Muscle Force During Isometric Elbow Efforts: A Forward Dynamics Approach. *Med Sci Sports Exerc* 35: S383, 2003

74. Williams G, Barrance P, Snyder-Mackler L, Axe MJ, Buchanan TS: Comparison of the specificity of muscle activation in ACL deficient and uninjured people. *Med Sci Sports Exerc* 34: S178, 2002

75. Sharma L, Lou C, Felson DT, Kirwan-Mellis G, Dunlop DD, Hayes KW, Weinrach D, Buchanan TS: Laxity in healthy and osteoarthritic knees: Reply *Arthritis & Rheum* 42: 2735-2736, 1999

76. Sharma L, Hayes KW, Felson DT, Buchanan TS, Kirwan-Mellis G, Lou C, Pai Y-C: Does laxity alter the relationship between strength and physical function in knee osteoarthritis? *Arthritis Rheum* 41: (9) S352-S352 Suppl. S, 1998

77. Sharma L, Dunlop DD, Lou C, Felson DT, Hayes KW, Kirwan-Mellis G and Buchanan TS: Laxity in healthy and osteoarthritic knees. *Arthritis Rheum* 41: (9) S352-S352 Suppl. S, 1998

78. Buchanan TS, Lloyd DG: Muscle activation at the human knee during isometric flexion-extension and varus-valgus loads. *J Orthop Sports Phys Therapy*, 26(1): 50, 1997

79. Buchanan TS, Kim AW, Lloyd DG: Selective muscle activation following rapid varus/valgus perturbations at the knee. *J Orthop Sports Phys Therapy*, 25(1): 92, 1997

80. Beckman S, Buchanan TS: The effects of ankle inversion injury and hypermobility on hip and ankle muscle onset latency, *Physical Therapy*, 74:S45, 1994

81. Lamble JA, Schuit D, Perkins R, Buchanan TS: Biomechanical relationship between ilial torsion and sacroiliac joint strain, *Physical Therapy*, 74:S108, 1994

82. Murray WM, Delp SL, Buchanan TS: Development of a graphics-based model of the human elbow: moment arm calculation issues, *J Biomech* 26:344, 1993

83. Buchanan TS, Beckman S, Rymer WZ: Ligament force feedback and the regulation of joint stability, *J Biomech* 25:673, 1992

84. Buchanan TS, Rovai GP, Rymer WZ: Muscle activation changes associated with loads at adjacent joints or why muscle moment arms are not sufficient to predict functional role, *J Biomech* 22:992, 1989

Book Chapters

85. Shao Q, Buchanan TS: Electromyography as a Tool to Estimate Muscle Forces. In: *Standard Handbook of Biomedical Engineering & Design*, 2nd edition. Ed: M Kutz. McGraw-Hill: New York, (in press) 2008

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