

## CURRICULUM VITAE

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## **Education and Training**

- 1980-1985     Princeton University, Princeton, NJ; B.S.E. (Civil Engineering)
- 1985-1991     University of Michigan, Ann Arbor, MI; M.S.E. (Industrial and Operations Engineering, 1990) and Ph.D. (Industrial and Operations Engineering, 1991)
- 1994-1996     Mayo Clinic, Rochester, MN; Physical Medicine and Rehabilitation
- 1999            University of Michigan, Ann Arbor, MI; Postdoctoral Research Training Program in Cell and Molecular Biology

## **Certification and Licensure**

Certified Professional Ergonomist (Board of Certification in Professional Ergonomics, Bellingham, WA).

## **Academic, Administrative, and Clinical Appointments**

- 1991-1994     Ergonomist, Safety and Health Applications and Research for Prevention Division, Washington State Department of Labor and Industries, Olympia, WA
- 1992-1996     Affiliate Assistant Professor, Department of Environmental Health, School of Public Health and Community Medicine, University of Washington, Seattle, WA
- 1994-1996     Research Fellow, Orthopedic Biomechanics Lab, Mayo Clinic, Rochester, MN
- 1994-1996     Instructor in Bioengineering, Mayo Medical School, Rochester, MN
- 1996            Instructor, Pierce College at Fort Lewis, Tacoma, WA
- 1997-1998     Safety Engineer, Human Factors Team, Protective Technology Branch, Division of Safety Research, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV
- 1997-1998     Team Leader, Human Factors Team, Protective Technology Branch, Division of Safety Research, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV
- 1998-2001     Assistant Professor, Department of Surgery, Section of Orthopaedic Surgery, University of Michigan, Ann Arbor, MI

- 2001-2004 Assistant Professor, Department of Orthopaedic Surgery, University of Michigan, Ann Arbor, MI
- 1999-2004 Assistant Professor, Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI
- 2002-present Affiliated faculty, Bioinformatics Program, University of Michigan, Ann Arbor, MI
- 2004-present Co-founder and Vice-President, White Pine Occupational Health Research LLC, Ann Arbor, MI
- 2004-present Associate Professor (with tenure), Department of Orthopaedic Surgery, University of Michigan, Ann Arbor, MI
- 2004-present Associate Professor, Department of Biomedical Engineering, University of Michigan, Ann Arbor, MI
- 2004-present Adjunct Associate Professor, Movement Science, Division of Kinesiology, University of Michigan, Ann Arbor, MI
- 2005-present Affiliated faculty, Center for Computational Medicine and Biology, University of Michigan, Ann Arbor, MI
- 2007-present Director, Laboratory for Optimization and Computation in Orthopaedic Surgery (LOCOS), Department of Orthopaedic Surgery, University of Michigan, Ann Arbor, MI
- 2008-present Associate Professor, Department of Industrial and Operations Engineering, University of Michigan, Ann Arbor, MI

## Research Interests

Optimization modeling in musculoskeletal medicine  
 Stochastic modeling in biomechanics  
 Incorporating cost-effectiveness explicitly in medical device design

## Grants

### *Past*

Musculoskeletal Transplant Foundation, “Prediction of upper extremity strength deficits resulting from osteoarticular allografts of the proximal humerus,” (R. Hughes, P.I.), \$33,271 total cost for total project period, 1/1/95-12/31/95. 0% effort. My role was to mathematically formulate model, develop software architecture, design validation experiment, collect *in vivo* data, perform statistical analyses, and prepare manuscripts. .

Mayo Foundation, “Evaluation of an arm endurance test for assessing rotator cuff treatment outcomes,” (R. Hughes, P.I.), \$10,413 total cost for total project period, 1/1/95-5/31/95. 0% effort. My role was to develop test fixture, collect data, and perform statistical analyses.

Clinical Partnership Research Fund, “Non-invasive in-vivo determination of shoulder kinematics in healthy and abnormal shoulders,” (J. Carpenter, P.I., R. Hughes, Co-P.I.), \$48,086 total cost for total project period, 7/9/99-7/8/00. 0% effort. My role was to design experiment, develop kinematic software, coordinate testing, perform statistical analyses, and prepare manuscripts.

Rackham School of Graduate Studies, “Development of an accurate shoulder motion measurement system,” (R. Hughes, P.I.), \$14,956 total cost for total project period, 1/1/00-12/31/00. 0% effort. My role was to develop experimental designs, coordinate testing, and prepare manuscripts.

University of Michigan Multipurpose Arthritis and Musculoskeletal Diseases Center, “Role of apoptosis in supraspinatus tendinosis,” (R. Hughes, P.I.), \$88,749 total cost for total project period, 1/1/00-12/31/01. 15% effort. My role was to develop test fixtures, automate assays, coordinate animal care, develop experimental designs, perform statistical analyses, and prepare manuscripts.

Orthopaedic Research and Education Foundation, “Biomechanical evaluation on reconstruction of the sternoclavicular joint,” (E. Spencer, P.I., R. Hughes, Co-Investigator), \$15,000 total cost for total project period, 1/1/01-12/31/01. 0% effort. My role was to perform statistical analyses.

University of Michigan Department of Surgery, “Investigation of glenoid tilt as a risk factor for rotator cuff pathology,” (R. Hughes, P.I.), \$41,849 total cost for total project period, 6/1/00-5/30/02. 0% effort. My role was to develop test fixtures, develop experimental design, coordinate testing, perform data analyses, and write manuscripts.

Orthopaedic Research and Education Foundation, “Investigation of glenohumeral joint laxity produced by sub-failure external rotation torque applied to the abducted shoulder,” (J. Kuhn, P.I., R. Hughes, Co-P.I.), \$98,749 total cost for total project period, 6/1/00-6/20/02. 0% effort. My role was to develop test fixtures and perform statistical analyses.

Whitaker Foundation, “Development of three-dimensional biomechanical model of the glenohumeral joint,” (R. Hughes, P.I.), \$209,375 total cost for total project period, 5/1/00-4/30/03. 25% effort. My role was project management, mathematical formulation, algorithm development, computer programming, experimental design, statistical analysis, and manuscript preparation.

Whitaker Foundation, “Development of three-dimensional biomechanical model of the glenohumeral joint,” (R. Hughes, P.I.), \$60,499, 7/1/03-6/30/04 (transitional year funding). 20% effort. My role is project management, mathematical formulation, computer programming, and manuscript preparation.

Office of the Vice President for Research of the University of Michigan, “Acquisition of an OptoTrak motion measurement system,” (R. Hughes, P.I.), \$27,184 total cost for project period, 7/1/04-6/30/05. 0% effort.

Stryker/Howmedica/Osteonics, “Innovation in Knee Navigation,” (A. Urquhart, P.I.; R. Hughes, Co-P.I.). \$44,161 total cost for six-month project period, 10/1/05-

3/31/06. 10% effort. My role is to design experiments, oversee data collection, and supervise data analysis.

National Institutes of Health, 1 R01 AR048540-01A2, "Structure-function of the glenohumeral joint," (R. Hughes, P.I.). \$551,245 total cost for total project period, 4/1/04-9/31/07. 30% effort. My role is to design experiment, conduct experiment, perform statistical analyses, perform stochastic simulations, perform project management, and prepare manuscripts.

University of Michigan Department of Orthopaedic Surgery, "Imaging rotator cuff muscle for computer modeling." (R. Hughes, P.I.). \$25,000 for one-year period. My role is to design and analyze experiments.

### *Current*

National Institutes of Health, "North American Congress on Biomechanics (NACOB) 2008." (R. Hughes, P.I.) \$8,750 total cost for project period, 4/1/08-3/31/09. 0% effort. My role is program co-chair for the meeting.

National Institutes of Health, "Software for stochastic musculoskeletal modeling." (R. Hughes, P.I.) \$124,162 total cost for one year period, 2/10/08-2/9/09. 25% effort. My role is to develop the mathematical model and software architecture.

### *Pending*

Bone and Joint Injury Prevention and Research Center, "Optimizing shoulder rehabilitation." (R. Hughes, P.I.) \$38,775 total cost for one year period.

American Shoulder and Elbow Surgeons, "Validation of a finite element model of the glenoid labrum." (J. Carpenter, P.I.; R. Hughes, Co-P.I.). \$20,000 total cost for a one year period.

Department of Orthopaedic Surgery, "Incorporating cost-effectiveness into a mixed integer programming classifier for diagnosing rotator cuff tears." (R. Hughes, P.I.). \$19,171 total cost for a one year period.

Arthex, Inc., "Estimation of supraspinatus force during rotator cuff rehabilitation exercises." (R. Hughes, P.I.; J. Carpenter, Co-I). \$64,423 total cost for eighteen month period. 10% effort. My role is to direct study and conduct mathematical modeling.

National Institutes of Health, "Software for Stochastic Musculoskeletal Modeling." (R. Hughes, Co-P.I.; Barbara McCreadie, Co-P.I.). \$792,586 total cost. This is a Phase II STTR application. To be submitted for the December 5, 2008, STTR deadline.

### *Preparing for submission or resubmission*

National Institutes of Health, “Shoulder function metric based on support vector machine modeling.” (R. Hughes, P.I.) \$153,000 total cost. Revising for A1 resubmission.

National Institutes of Health, “Probabilistic modeling of the arm for robust engineering.” (R. Hughes, P.I.) \$1,710,000 total cost. Revising for A1 resubmission.

National Institutes of Health, “Manual materials handling and rotator cuff MMP-1 expression.” (R. Hughes, P.I.) \$1,422,916. Revising for A1 resubmission.

## Honors and Awards

1985	William P. Condit Senior Thesis Prize, Princeton University
1985	Graduation with Highest Honors in Civil Engineering from Princeton University
1985-1986	University of Michigan Regents Fellowship
1986-1990	NASA Fellow in Man-Systems Interaction
1990	Outstanding Graduate Student in Industrial & Operations Engineering Department, University of Michigan
1990	Pre-Doctoral Young Scientist Award, American Society of Biomechanics
1994-2003	Sigma Xi member
1994	NIH traineeship
2008	Excellence in Research Award, The American Orthopaedic Society for Sports Medicine

## Memberships in Professional Societies

American Society of Biomechanics  
Biomedical Engineering Society  
Institute for Operations Research and Management Science  
Orthopaedic Research Society  
Society for Medical Decision Making

## Editorial Positions, Boards, and Peer-Review Service

### *Editorial and advisory boards*

2000-2003	Member of editorial board for Journal of Applied Biomechanics.
2000-present	Member of international advisory board, Scandinavian Journal of Work, Environment & Health
2007-present	Member of editorial board, The Open Biomedical Engineering Journal

### *Reviewer*

2003-present	American Journal of Sports Medicine
1997-present	Annals of Biomedical Engineering
1993	Applied Ergonomics
1994	Applied Occupational and Environmental Health

2003-present	Archives of Physical Medicine and Rehabilitation
1996-present	ASME Journal of Biomechanical Engineering
2002-present	Clinical Biomechanics
2003-present	Clinical Orthopaedics and Related Research
1994-present	Ergonomics
2000-present	European Journal of Applied Physiology
2006-present	Health Care Management Science
1995-present	Human Factors
2008	Human Movement Science
1996-present	IEEE Transactions on Biomedical Engineering
1999-present	Journal of Applied Physiology
1995-present	Journal of Biomechanics
2001-present	Journal of Bone and Joint Surgery – American Volume
1995	Journal of Electromyography and Kinesiology
1997	Journal of Musculoskeletal Research
1995	Journal of Neurophysiology
1995-present	Journal of Orthopaedic Research
2000-present	Journal of Shoulder and Elbow Surgery
1996-present	Mathematical Biosciences
1994-present	Scandinavian Journal of Work, Environment and Health
2007-present	IEEE Transactions on Neural Systems & Rehabilitation Engineering

## Teaching

### *Courses developed and taught*

2009	Industrial and Operations Engineering 491 <i>Optimization in Medical Treatment and Diagnosis</i> , University of Michigan, MI
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### *Courses co-taught*

1992	Environmental Health 497 <i>Introduction to Ergonomics</i> . University of Washington, Seattle, WA
1996	Math 156 <i>Finite Mathematics</i> . Pierce College, Tacoma, WA
1996	Math 157 <i>Elements of Calculus</i> . Pierce College, Tacoma, WA

### *Lectures in courses*

2001	UC 280 <i>Undergraduate Research</i> , University of Michigan
2001	BME 295 <i>Biomedical Engineering Seminar</i> , University of Michigan
2001-present	BME 450 <i>Biomedical Design</i> , University of Michigan
2002-present	BME 500 <i>Biomedical Engineering Seminar</i> , University of Michigan
2002-present	1MUSL.U <i>Applied Anatomy of the Musculoskeletal System</i> , University of Michigan
2003	BME 456 <i>Biomechanics</i> , University of Michigan
2003	IOE 333 <i>Ergonomics</i> , University of Michigan
2005	BME 231 <i>Introduction to Biomechanics</i> , University of Michigan

### *Orthopaedic basic science lectures*

1999-present "Kinesiology."  
2001-present "Joint loading."  
2003-present "Kinematics."  
2000-present "Statistics for OITE."  
2003-present "Intervertebral disc."  
2005-present "Basic science of tendon."  
2005-present "Decision analysis."  
2006-present "Critically reading orthopaedic literature."  
2006-present "Ligament biomechanics."

### *Qualifying exam committees*

2000 Clark Dickerson (Biomedical Engineering)  
2001 Brandon Laurie (Biomedical Engineering)  
2001 Brian Schulz (Biomedical Engineering)  
2002 Sybelle Theis (Biomedical Engineering)  
2003 Tom Withrow (Biomedical Engineering)

### *Mentoring*

Graduate students:

1992 Elizabeth Robinson (Human Factors Interdepartmental Program, College of Engineering, University of Washington, Seattle, WA)  
1998-2000 Mona Bhuta (Mechanical Engineering)  
1998-2000 Linda Gallo (Biomedical Engineering)  
1998-2000 Jason Wening (Biomedical Engineering)  
1999-2002 Suzanne LaScalza (Biomedical Engineering)  
1999-2005 Joe Langenderfer (Biomedical Engineering)  
2000-2001 Cari Bryant (Mechanical Engineering)  
2001 Craig Hadgis (Biomedical Engineering)  
2001-2002 Joe Dougherty (Mechanical Engineering)  
2001-2002 Noah Bartsch (Biomedical Engineering)  
2001 Angena Parekh (Biomedical Engineering)  
2002 Tiffany Viant (Biomedical Engineering)  
2002 Nihar Kanodia (Biomedical Engineering)  
2002 Jason Emeott (Biomedical Engineering)  
2002-2003 Nicole Ritchie (Biomedical Engineering)  
2002 Ben Singer (Bioinformatics Program, Medical Scientist Training Program)  
2004 Cameron Patthanacharoenphon (Biomedical Engineering)  
2003-2005 Jason Scibek (Division of Kinesiology)  
2004 Erin McIntyre (Mechanical Engineering and Biomedical Engineering)  
2005 Joe Cullen (Mechanical Engineering)  
2006 Chris Gatti (Biomedical Engineering)  
2006 Alexis Goolik (Biomedical Engineering)

2006 Andrew DiGeorge (Biomedical Engineering)  
2006 Nick Flieg (Biomedical Engineering)  
2008 Griffin Dixon (Biomedical Engineering)  
2008 Jia Li (Biomedical Engineering)

Undergraduates:

2000 Amy Hepper (Chemical Engineering)  
2000 Craig Hadgis (Industrial and Operations Engineering)  
2001 Jane Arico (Literature, Science and Arts)  
2001 Elizabeth Kinneer (Engineering)  
2001 Cameron Patthanachoenphon (Mechanical Engineering)  
2002 Adrienne Lehnert (Nuclear Engineering)  
2003 Seth Zuckerman (Literature, Science and Arts)  
2004 Ray Wu (Operations Research, Cornell University)  
2004 Aaron Silver (Mathematics, Duke University)  
2004-2005 Chris Gatti (Mechanical Engineering)  
2005 David Smith (Biopsychology)  
2006 Calista Harbaugh (Biomedical Engineering)  
2006 David Segala (Biomedical Engineering, University of Rhode Island)  
2007 Gunjan Sud (Industrial and Operations Engineering)  
2007 Adriana Blazeski (Biomedical Engineering)  
2008 Thai-Son Nguyen (Biomedical Engineering)  
2008 Hassan Awada (Biomedical Engineering)  
2008 Erica Rutter (Mathematical Biology, SUBMERGE program)  
2008 Anthony Brune (Mathematical Biology, SUBMERGE program)  
2008 Ryan Shin (Mathematics)

Residents and fellows (conducting lab projects):

1999 Ed Yian, M.D. (Resident, Orthopaedic Surgery)  
1999-2000 Edwin Spencer, M.D. (Resident, Orthopaedic Surgery)  
2001 Li Chen, M.D. (Resident, Orthopaedic Surgery)  
2001 Jennifer Swaringen, M.D. (Resident, Orthopaedic Surgery)  
2002-2003 Neena Szuch, M.D. (Resident, Orthopaedic Surgery)  
2004 Mark Friedman, M.D. (Resident, Orthopaedic Surgery)  
2005 Aaron Guyer, M.D. (Resident, Orthopaedic Surgery)  
2005 Tom Moyad, M.D. (Resident, Orthopaedic Surgery)  
2006 Bryson Lesniak M.D. (Resident, Orthopaedic Surgery)  
2007 Asheesh Bedi, M.D. (Resident, Orthopaedic Surgery)  
2008 Todd Bafus (Resident, Orthopaedic Surgery)  
2008 Joy Long (Sports Fellow, Orthopaedic Surgery)

Medical students (conducting lab projects):

2000 Ron Hollis  
2001 Andrew Wong  
2001 Vijay Thangamani  
2001 Patrick Guffey

2002	Seth Jerabek
2002	Victor Hakim
2003-2004	Matt Lungren
2003,2005	Ramesh Srinivasan
2005-2007	Joe Maratt
2005-2006	Ya-Sin Peaks
2006	Michael Borofsky
2007	Cameron Patthanacharoenphon
2008	Alan Chu
2008	Christina Feng
2008	Michael Charters

Others:

2002-2004	Brian Childress (General Motors)
2005	Drew Donnell (Community High)
2006	Scott Sorensen

*Medical student rotations*

1999	Jessica Cooper
2001	Allison MacLennan
2001	Ron Hollis
2005	Ramesh Srinivasan
2006	Jacqueline Munch
2006	Matt Lungren
2007	Joe Maratt

*Dissertation committees*

1996	Mark McMulkin, Ph.D., Department of Industrial Engineering and Operations Research, Virginia Polytechnic Institute and State University, Blacksburg, VA.
2002-2004	Brian Schulz, Department of Biomedical Engineering
2003-2004	Sibylle Thies, Department of Biomedical Engineering
2001-2004	Clark Dickerson, Department of Biomedical Engineering (co-chair)
2002-2005	Joe Langenderger, Department of Biomedical Engineering (chair)
2003-2005	Tom Withrow, Department of Biomedical Engineering
2004-2005	Jason Scibek, Division of Kinesiology (chair)
2006-present	Chia-Yuan Chang, Department of Mechanical Engineering

*Continuing medical education courses taught*

1992	<i>Ergonomics for the Therapist.</i> Washington Occupational Therapy Association, Seattle, WA
1992	<i>Introduction to Industrial Hygiene.</i> Northwest Center for Occupational Health, University of Washington, Seattle, WA
1993	<i>Introduction to Ergonomics.</i> Washington Committee on Occupational Safety and Health, Seattle, WA

- 1994 *Ergonomics for Managers*. Northwest Center for Occupational Health, University of Washington, Seattle, WA
- 1994 *Office Ergonomics*. Northwest Center for Occupational Health, University of Washington, Seattle, WA
- 1997 *Advances in Ergonomics*. Northwest Center for Occupational Health, University of Washington, Seattle, WA
- 1999 *Shoulder Symposium* (Co-director) University of Michigan, Ann Arbor, MI
- 2002 *Shoulder Symposium* (Co-director) University of Michigan, Ann Arbor, MI
- 2004 *Shoulder Symposium* (Co-director) University of Michigan, Ann Arbor, MI
- 2008 *Ergonomic Interventions and Research: Preventing Workplace Musculoskeletal Disorders*, Oakland, CA

*Industrial training*

- 1991-1993 Occupational biomechanics training conducted in the aluminum reduction, pulp and paper, lumber, plywood, and poultry industries in Washington state.

**Committee, Organizational, and Volunteer Service**

*Institutional*

- 1992-1994 Ergonomics Task Force, Washington State Department of Labor and Industries.
- 1993 Project Selection Committee of the Safety and Health Assessment and Research for Prevention Division, Washington State Department of Labor and Industries
- 1993 Reorganization Team for the Research and Information Services Division of the Washington State Department of Labor and Industries.
- 1996 Fellows Coordinator, Orthopedic Biomechanics Lab, Mayo Clinic
- 1998-2004 Member, Center for Biomedical Engineering Research
- 1999-2001 Member, University of Michigan Multipurpose Arthritis and Musculoskeletal Diseases Center
- 2000-2001 Commodities Working Group, Section of Orthopaedics, Department of Surgery, University of Michigan
- 2001-2003 Interview Panel, Fullbright Fellowship, International Institute

- 2001-2004 Executive Board, University of Michigan Children's Centers
- 2001-present Curriculum Committee, Department of Orthopaedic Surgery
- 2001-present Graduate Admissions Committee, Department of Biomedical Engineering
- 2002-present Orthopaedic resident applicant interviewer
- 2002 Ad Hoc Committee on Medical Student Research, Department of Orthopaedic Surgery
- 2006-present Research Advisory Committee, Department of Orthopaedic Surgery
- National*
- 1995 Abstract reviewer, Human Factors and Ergonomics Society Annual Meeting
- 1995 Session co-chair, Human Factors and Ergonomics Society Annual Meeting
- 1996 Nominating committee, American Society of Biomechanics
- 1996 Abstract reviewer, Human Factors and Ergonomics Society Annual Meeting
- 1997 Program committee, American Society of Biomechanics Annual Meeting
- 1997 Session chair, American Society of Biomechanics Annual Meeting
- 1998 Reviewer, Alice Hamilton Award of the National Institute for Occupational Safety and Health, Centers for Disease Prevention and Control.
- 1998 Grants Office Advisor, National Institute for Occupational Safety and Health, Centers for Disease Prevention and Control.
- 1998 Awards committee, American Society of Biomechanics Annual Meeting
- 1999 Program committee, American Society of Biomechanics Annual Meeting
- 2000 Program committee, American Society of Biomechanics Annual Meeting
- 2000 Session chair, American Society of Biomechanics Annual Meeting
- 2000 Nominating committee, American Society of Biomechanics
- 2000-2003 Member of NIH special emphasis panel SSS-9, which is part of the Surgery, Radiology and Bioengineering Integrated Review Group.
- 2001 Abstract reviewer, Human Factors and Ergonomics Society Annual Meeting
- 2002 Program committee, American Society of Biomechanics Annual Meeting
- 2002 Abstract reviewer, Human Factors and Ergonomics Society Annual Meeting
- 2002 Reviewer, American Society of Biomechanics Grants-in-Aid Program
- 2006 Abstract reviewer, 2007 American Society of Biomechanics Annual Meeting
- 2006 Reviewer, National Athletic Trainers' Association Grant Program
- 2006-2007 Program Chair-elect of the American Society of Biomechanics for the North American Congress on Biomechanics (NACOB) meeting
- 2006-2008 Member, executive board of the American Society of Biomechanics
- 2007 Abstract reviewer, 2008 Orthopaedic Research Society Annual Meeting
- 2007 Session chair, Institute for Operations Research and Management Science Annual Meeting
- 2008 Program Co-Chair, North American Congress on Biomechanics (NACOB)

2008 Abstract reviewer, 2009 Orthopaedic Research Society Annual Meeting  
2008 Session chair, Institute for Operations Research and Management Science  
Annual Meeting

### **Consulting Positions**

2003 Zimmer, Inc. (unpaid)  
2005 Union Pacific Railroad

### **Visiting Professorships, Seminars, and Extramural Invited Presentations**

- “Differentiating Between Competing Optimization-Based Muscle Force Prediction Models,” Seminar, Orthopedic Biomechanics Lab, Mayo Foundation, Rochester, MN, December 17, 1990.
- “Differentiating Between Competing Optimization-Based Muscle Force Prediction Models,” Seminar, Industrial Engineering Program, University of Washington, Seattle, WA, April 7, 1992.
- “Differentiating Between Competing Optimization-Based Muscle Force Prediction Models,” Seminar, Occupational Medicine Grand Rounds, University of Washington, Seattle, WA, June 4, 1992.
- “Participatory Design in Large Capital Expenditure Projects,” Invited Presentation, Washington State Governor's Safety Conference, Seattle, WA, October 14, 1993.
- “Rotator Cuff Disorders and Shoulder Fatigue,” Invited Presentation, American Automobile Manufacturers Association Muscle Fatigue Workshop, Detroit, MI, July 21-22, 1997.
- “Modeling Upper Extremity Strength: Theory and Clinical Application,” Seminar, Orthopedic Biomechanics Lab, West Virginia University, Morgantown, WV, November 14, 1997.
- “Occupational Biomechanics of the Rotator Cuff,” Seminar, Center for Ergonomics, University of Michigan, Ann Arbor, MI, December 2, 1997.
- “Modeling Upper Extremity Strength: Theory and Clinical Application,” Seminar, Bioengineering Seminar, University of Pittsburgh, Pittsburgh, PA, January 9, 1998.
- “Occupational Biomechanics of the Rotator Cuff,” Seminar, Department of Industrial Engineering, University of Pittsburgh, Pittsburgh, PA, February 26, 1998.
- “Occupational Biomechanics of the Rotator Cuff,” Invited Presentation, Division of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Cincinnati, OH, February 27, 1998.

- “Occupational Biomechanics of the Rotator Cuff,” Seminar, Michigan State University Laboratory for Comparative Orthopaedic Research, Michigan State University, East Lansing, MI, May 6, 1999.
- “Clinical Research Methodology,” Invited Presentation, Orthopaedic Surgery Grand Rounds, Wayne State University, Detroit, MI, June 16, 1999.
- “Modeling Upper Extremity Strength: Theory and Clinical Application,” Seminar, Bioengineering Seminar, Virginia Polytechnic Institute and State University, Blacksburg, VA, February 7, 2000.
- “Clinical Research Methodology,” Invited Presentation, Orthopaedic Surgery Grand Rounds, Wayne State University, Detroit, MI, June 21, 2000.
- “A mechanical analysis of scapular morphology and rotator cuff pathology,” Seminar, Mechanical and Industrial Engineering, University of Illinois, Urbana-Champaign, IL, November 10, 2000.
- “Effect of wearing a back belt on torso kinematics,” Seminar, Department of Physical Therapy and Movement Science, Northwestern University, Chicago, IL, October 18, 2001.
- “Role of glenoid inclination in shoulder modeling,” Seminar, Sensory Motor Performance Program, Rehabilitation Institute of Chicago, Northwestern University, Chicago, IL, October 19, 2001.
- “Role of glenoid inclination in shoulder modeling,” Seminar, Department of Mechanical and Aerospace Engineering, University of Notre Dame, South Bend, IN, November 20, 2001.
- “Role of glenoid inclination in shoulder modeling,” Seminar, Bone and Joint Center, Henry Ford Hospital, Detroit, MI, July 19, 2002.
- “Glenoid inclination and rotator cuff pathology,” Invited Presentation, Department of Orthopaedic Surgery, University of North Carolina, Chapel Hill, NC, September 4, 2002.
- “Biomechanical analysis of rotator cuff disorders,” Seminar, Department of Physical Therapy and Movement Science, Northwestern University, Chicago, IL, August 14, 2003.
- “Glenoid inclination and rotator cuff pathology,” Seminar, Department of Biomedical, Industrial, and Human Factors Engineering, Wright State University, Dayton, OH, February 16, 2004.
- “Optimization modeling of shoulder rehabilitation,” Invited Presentation, Biomedical Engineering Conference, Mayo Clinic, Rochester, MN, June 23, 2006.
- “Glenoid inclination and rotator cuff pathology”, Seminar, Department of Health and Human Development, Montana State University, Bozeman, MT, April 30, 2007.

“Glenoid inclination and rotator cuff pathology,” Seminar, Department of Human Physiology, University of Oregon, Eugene, OR, November 2, 2007.

“Integer programming model of distal humerus fracture fixation: An application of mathematical programming in orthopaedic surgery,” Seminar, Department of Industrial, Welding, and Systems Engineering, Ohio State University, Columbus, OH, November 28, 2007.

“Glenoid inclination and rotator cuff pathology.” Seminar, School of Kinesiology, University of Windsor, Windsor, Ontario, October 10, 2008.

## Bibliography

### *Peer-Reviewed Publications*

1. Hughes, R.E. and Powell, W.B. (1988) Mitigating end effects in the dynamic vehicle allocation model. *Management Science* 34(7): 859-879.
2. Thompson, D.D., Chaffin, D.B., Hughes, R.E., and Evans, O. (1992) The relationship of isometric strength to peak dynamic hand forces during submaximal weight lifting. *International Journal of Industrial Ergonomics* 9(1): 15-23.
3. Lavender, S.A., Tsuang, Y.H., Hafezi, A., Andersson, G.B.J., Chaffin, D.B., and Hughes, R.E. (1992) Coactivation of the trunk musculature during asymmetric loading of the torso. *Human Factors* 34(2): 239-247.
4. Redfern, M.S., Hughes, R.E., and Chaffin, D.B. (1993) High-pass filtering to remove electrocardiographic interference from torso EMG recordings. *Clinical Biomechanics* 8(1): 44-48.
5. Kerk, C.J., Chaffin, D.B., Page, G.B., and Hughes, R.E. (1994) A comprehensive biomechanical model using strength, stability, and COF constraints to predict hand force. *IIE Transactions* 26(3): 57-67.
6. Hughes, R.E., Chaffin, D.B., Lavender, S.A., and Andersson, G.B.J. (1994) Evaluating muscle force prediction models of the lumbar trunk using surface electromyography. *Journal of Orthopaedic Research* 12(5): 689-698.
7. Hughes, R.E. and Chaffin, D.B. (1995) The effect of strict muscle stress limits on abdominal muscle force predictions for combined torsion and extension loadings. *Journal of Biomechanics* 28(5): 527-533.
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4. Doro, L.C., Ladd, B., Hughes, R.E., and Chenevert, T.L. A realistic calibration phantom for quantification of fatty infiltration in muscle using MRI. Accepted by *Magnetic Resonance Imaging*.

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