

CURRICULUM VITAE

Mark Palmer

Assistant Professor Division of Kinesiology
Assistant Professor Biomedical Engineering
University of Michigan
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Education

- 1991 - 2004 **University of Michigan**, Ann Arbor, Michigan
Medical Scientist Training Program
- *M.D.* (Research Distinction)
 - *Ph.D.* Mechanical Engineering (Tau Beta Pi Engineering Honors Society)
 - *Ph.D. Thesis*: "A Non-Linear Hierarchical Model of Stretch-Induced Injury to Skeletal Muscle Fibers" focusing on the use of computational modeling to show the initiation and spread of injury in muscle cells.
 - *M.S.E.* in Mechanical Engineering
 - *M.S.* in Bioengineering
- 1987 - 1991 **Princeton University**, Princeton, New Jersey
B.S. in Mechanical and Aerospace Engineering
Senior Thesis: 1991 Northeast Regional Society of Automotive Engineering Mini-Baja Competition for the design and construction of an amphibious vehicle around a standard, unmodified engine.
- Voted team captain by teammates.
 - Designed and constructed the chassis and power train.
 - Achieved the first top ten finish in Princeton history (8th place out of a field of 45 vehicles).

Honors and Awards

- 2005-2007 Regenerative Medicine Fellow
2004 Research Distinction, Medical Scientist Training Program
1999 Inducted into the Tau Beta Pi Engineering Honors Society
1994-2004 Medical Scientist Training Program Fellow
1993-1994 Merck Research Fellow
1991-1993 Rackham Merit Fellowship
1991 Inducted into the Sigma Xi Scientific Research Society, Princeton
1991 Association of Black Princeton Alumni Scholastic Achievement Award
1990-1991 National Association of Minority Engineering Program Administrators Certificate of Merit for Achievement
1990 AT&T Bell Laboratories Scholastic Achievement Award
1989-1990 National Association of Minority Engineering Program Administrators Certificate of Merit for Achievement
1987-1991 National City Foundation Scholarship
1987-1991 National Merit Scholarship

Professional Experience

- 2007-present President/Chief Technical Officer – Reveal Technologies Group, Grand Rapids, MI
- Conceived and implemented a novel technology for applying computational modeling techniques to advanced materials and biological systems
 - Managed overall development of technology platform
 - Successfully implemented fund raising strategy
 - Orchestrated the intellectual property protection plan
 - Served as principle investigator for extramural grants and projects
- 2004 - 2006 Research Lead - Patmos FEA Consulting, Grand Rapids, MI
- Conceived development of novel technology platform
 - Managed projects focused on advancing technology platform
 - Performed sales and marketing presentations
 - Coordinated relationships between Company and Business Incubators

Research Experience

- 2004 - 2007 University of Michigan, Ann Arbor, Michigan
Research Fellow, Muscle Mechanics Laboratory (Mentor: John Faulkner, Ph.D.)
- Initiated theoretical analysis and designed experiments for evaluating hypotheses in skeletal muscle function.
 - Developed collaborative relationships between the Muscle Physiology Department and the Mechanical Engineering Department.
 - Performed tactical analysis of data from other research projects.
 - Collaborated in the formulation of applications for funding.
 - Participated in mentoring doctoral candidates through the process of formulating a dissertation topic to the thesis defense.
- Sep. 2002 University of Michigan Medical Center, Ann Arbor, Michigan
Research Assistant - Radiation Oncology Department (Mentor: James Balter, Ph.D.)
- Analyzed and extended functionality of software for combining computed tomography (CT scan), magnetic resonance imaging (MRI), and warped image sets towards analysis of dose delivery based on motion of organs due to breathing to optimize delivery of radiation to a tumor.
- 1996 - 2001 University of Michigan
Doctoral Candidate, Mechanical Engineering and Medical Student
- Ph.D. Thesis: "A Non-Linear Hierarchical Model of Stretch-Induced Injury to Skeletal Muscle Fibers" focusing on the use of computational modeling to show the initiation and spread of injury in muscle cells.
 - Committee: Scott Hollister, Ph.D.,(co-chair); John Faulkner, Ph.D. (co-chair); Robert Dennis, Ph.D.; Noboru Kikuchi, Ph.D.; Alan Wineman, Ph.D.
 - Established computational mechanics and modeling of skeletal muscle in the Muscle Mechanics Laboratory.
 - Conducted independent research investigating the mechanism of injury in skeletal

muscle.

- Developed theoretical modeling techniques and algorithms for skeletal muscle research.

1991 - 1996

University of Michigan, Ann Arbor, Michigan
Research Assistant - Orthopaedic Research Laboratory
Advisor: Steven A. Goldstein, Ph.D.

- Performed image processing of CT scans for a project investigating the effects of osteoporosis, mentor: Steven A. Goldstein, Ph.D.
- Initiated and conducted computational modeling to investigate optimal bone architecture, mentor: Scott J. Hollister, Ph.D.
- Constructed instrumentation and developed analysis algorithms for studies on shoulder mechanics, mentor: Louis J. Soslowsky, Ph.D.
- Performed computational modeling to investigate the interface between bone, cement, and an artificial joint, mentor: Scott J. Hollister, Ph.D.

Extramural Grant & Report Reviewer

National Institutes of Health – Small Business Innovation Research and Small Business Technology Transfer Program

Awarded Patents

Palmer, Mark L., "Virtual Resolution enhancement in diagnostic imaging using FEA", Issue Date: 12/30/2008. Patent Number 7,471,816.

Manuscripts in Preparation

1. **Palmer M.L.**, Claflin D.R., Faulkner J.A., Panchangam A., "The effects of preconditioning on the sarcomere length distribution in single fibers from rat soleus muscles".
2. **Palmer M.L.**, "A computational model for activated stretch of myofibrils from mammalian skeletal muscle".

Manuscripts in Review

1. Ramaswamy K.S., **Palmer, M.L.**, Chamberlain J.S., Faulkner, J.A., "Lateral transmission of force is impaired in skeletal muscles of dystrophic mice".

Peer Reviewed Publications

1. R B Blasier, L J Soslowsky, D M Malicky, and **M L Palmer**, "Posterior Glenohumeral Subluxation: Active and Passive Stabilization in a Biomechanical Model," *Journal of Bone and Joint Surgery (American Volume)*,79-A:433-440, March 1997.

2. Panchangam A., Claflin D. R., **Palmer M. L.**, and Faulkner J. A., "Magnitude of sarcomere extension correlates with initial sarcomere length during lengthening of activated single fibers from soleus muscle of rats", *Biophysical Journal*, 95: 1890-1901, 2008.

Refereed Conference Publications & Presentations

1. A Lerner, M Palmer, C Flanagan, A Shulick, C Jagers, S Goldstein, "Effects of Ovariectomy and Calcitonin Treatment on Cortical Bone Mechanical and Geometric Properties in the Beagle," Transactions of the 39th Annual Orthopaedic Research Society (1993), p. 552.
2. D M Malicky, R B Blasier, R E Guldborg, J L Borodkin, M L Palmer, and L J Soslowsky, "Anterior Glenohumeral Stabilization Efficiency in a Biomechanical Model Combining Ligamentous and Muscular Constraints," Transactions of the 39th Annual Orthopaedic Research Society (1993), p. 314.
3. R B Blasier, D M Malicky, R E Guldborg, J L Borodkin, M L Palmer, and L J Soslowsky, "Anterior Glenohumeral Stabilization Efficiency in a Biomechanical Model Combining Ligamentous and Muscular Constraints," Transactions of the Japanese Orthopaedic Association (1993).
4. R B Blasier, L J Soslowsky, D M Malicky, R E Guldborg, J L Borodkin, and M L Palmer, "Anterior Glenohumeral Stabilization Efficiency in a Biomechanical Model Combining Ligamentous and Muscular Constraints," Transactions of the European Society for Surgery of the Shoulder and Elbow (1993).
5. M L Palmer, S J Hollister, N Kikuchi, "On the Optimality of Bone Structure in the Proximal Femur," Transactions of the 40th Annual Orthopaedic Research Society (1994), p. 59.
6. D M Malicky, M L Palmer, L J Soslowsky, R B Blasier, "Posterior Glenohumeral Stabilization Factors: Progressive Effects in a Biomechanical Model," Transactions of the 40th Annual Orthopaedic Research Society (1994), p. 225.
7. J P Rouleau, M L Palmer, S J Hollister, D C Moore, R Huiskes, "Development of a Local Homogenization Model of the Trabecular Bone - Cement Interface", Transactions of the 41st Annual Orthopaedic Research Society (1995), p. 752.
8. M L Palmer, J A Faulkner, R G Dennis, S J Hollister, "A Hierarchical Model of a Quiescent and Maximally Activated Fiber During Stretch", *Biophysical Journal* 44th Annual Meeting (2000), Vol 78, p. 333A, 1972-Pos.
9. M L Palmer, S J Hollister, R G Dennis, J A Faulkner, "A Hierarchical Model of a Quiescent and Maximally Activated Fiber During Stretch", *Proceedings of the 11th International Conference on Mechanics in Medicine and Biology* (2000), p. 7.
10. M L Palmer, J A Faulkner, R G Dennis, S J Hollister, "A Computational Model for Stretch-Induced Injury in Skeletal Muscle", *18th Congress of the International Society of Biomechanics Book of Abstracts* (2001), p. 24.
11. M L Palmer, J A Faulkner, R G Dennis, S J Hollister, "The Etiology Of Injury In Skeletal Muscle Fibers: Large Deformation Of A Non-Linear Composite With An Active Stress Component ",

- Proceedings of the 6th United States National Congress on Computational Mechanics (2001), p. 510.
12. M L Palmer, J A Faulkner, R G Dennis, S J Hollister, " A Non-Linear Hierarchical Model for Contraction-Induced Injury in Skeletal Muscle", Proceedings of the 5th International Symposium on Computational Methods in Biomechanics and Bioengineering (2001).
 13. M L Palmer, J A Faulkner, R G Dennis, S J Hollister, "A Multi-Level Structural Model for the Stretch of Maximally Activated Single Permeabilized Fibers: Role of Desmin", Biophysical Journal 46th Annual Meeting (2002).
 14. M L Palmer, S J Hollister, R G Dennis, J A Faulkner, "A Non-Linear Analytical Model for the Role of Desmin in Skeletal Muscle Fibers", Proceedings of the 12th International Conference on Mechanics in Medicine and Biology (2002).
 15. A Panchangam, D R Claflin, M L Palmer, J A Faulkner, "Sarcomere Length Non-Uniformity During Active Stretches of Human Permeabilized Fibers", Biophysical Journal 90:158a, 2006.
 16. A Panchangam, D R Claflin, M L Palmer, J A Faulkner, "Injury-Inducing Stretches of Activated Skeletal Muscle Fibers Increase Passive Sarcomere Length Heterogeneity", Biophysical Journal [in press]. Baltimore, M.D. (2007), 301a, 1415-Pos.
 17. Panchangam A, Claflin DR, Palmer ML, Faulkner JA. "During Lengthening Contractions Of Permeabilized Single Muscle Fibers, The Regions At The Longest Initial Sarcomere Lengths Undergo The Greatest Elongation". Biophysical Society Meeting, Long Beach, CA, February 2-6, 2008. Biophysical Journal, Volume 94, Issue 2S, Abstract, 617-Pos.
 18. Panchangam A, Claflin DR, Palmer ML, Faulkner JA. "Development of Sarcomere Length Non-Uniformity During Lengthening Contractions of Permeabilized Single Muscle Fibers from Rat." Abstract #471, Podium Session 29, 4th North American Congress on Biomechanics, Ann Arbor, MI, August 5-9, 2008. (<http://www.x-cdtech.com/nacob/abstracts/471.pdf>)
 19. Panchangam A, Claflin DR, Palmer ML, Faulkner JA. "Magnitude of Sarcomere Extension Correlates with Initial Sarcomere Length during Lengthening of Activated Single Fibers from Soleus Muscle of Rats", Biophysical Journal, Volume 96, Issue 3, Supplement 1, February 2009, Page 617a, 3181-Pos.

Graduate Student Committees

Primary Mentor

Jesal Parekh, School of Kinesiology, pre-candidate

Eunjoo Hwang, Biomedical Engineering, pre-candidate

Doctoral Committee

Appaji Panchangam, Biomedical Engineering, Fall 2007

Masters Committee

Brandon Hisey, Kinesiology, University of Calgary, July 2009

Teaching

Movesci 330: Biomechanics, Fall 2008, Winter 2009

Funded Grants

NIH-SBIR “Analysis Tool for Age Related Changes in Muscle”, **M. Palmer (PI), Funded** - Total Budget \$100,000.

Grants in Review

NIH-NIA “Genetic Modification of Muscle in Aging and Disease”, J. Metzger (PI), J. Faulkner (Co-I), D. Michele (Co-I), J. Chamberlain (Co-I), **Palmer (Co-I)**. Total Direct Costs \$5,314,307.

NIH-NIA Grand Opportunities - “Development of a Multiscale Hierarchical Model of the Effect of Age on Untrained and Highly Trained Striated Muscle”, J. Ashton-Miller (PI), J. Faulkner (Co-I), **Palmer (Co-I)**. Total Direct Costs ~\$1.2million.

Grants in Preparation

R21 – “ACL laxity contributions to injury risk”, S. McLean (PI), **M. Palmer (co-PI)**.

Invited Lectures

- Sept 20, 2009 “Hierarchical Models of Muscle”, *Workshop on Multiscale Muscle Mechanics*, Marine Biological Laboratory, Woods Hole, Massachusetts, September 18-21, 2009.
- Feb 20, 2008 “Computational Modeling of Skeletal Muscle”, *Biomedical Engineering – Electrical Biophysics (BME 417)*, University of Michigan, Ann Arbor, Michigan
- Feb 18, 2008 “Etiology of Injury in Skeletal Muscle”, *Biomedical Engineering – Electrical Biophysics (BME 417)*, University of Michigan, Ann Arbor, Michigan
- Feb 16, 2007 “Computational Modeling of Skeletal Muscle”, *Biomedical Engineering – Electrical Biophysics (BME 417)*, University of Michigan, Ann Arbor, Michigan
- Feb 9, 2007 “The Role of Multilevel Modeling of Human Skeletal Muscle”, Division of Kinesiology, University of Michigan, Ann Arbor, Michigan
- Aug 4, 2006 “Benefits/Advantages of Computational Modeling of Human Skeletal Muscle”, *Grand Rounds - Continuing Medical Education Series*, Mary Free Bed Rehab Hospital, Grand Rapids, Michigan.

- Greater than 65% of attendees rated presentation with the highest possible scores.
- Seventy percent of attendees reported that the presentation would “definitely improve their clinical performance”.

- Nov 16, 2005 "Exploring Sarcomere Dynamics in Skeletal Muscle Fibers Using Finite Element Analysis", *Biomedical Engineering (BME 500)*, University of Michigan, Ann Arbor, Michigan.
- Oct 13, 1999 "Computational Modeling of Skeletal Muscle", *Biomedical Engineering (BME 506) Computational Methods in Biology*, University of Michigan, Ann Arbor, Michigan.

Professional Service

- Dec 2009 Marshall – December Commencement
- Nov 2009 Representative – Committee on Institutional Cooperation – 3rd Biennial Kinesiology Diversity Summit
- 2007 - 2008 Graduate Admissions Committee – Biomedical Engineering
- 2005 - 2007 Board Member
Western Michigan Science and Technology Initiative. WMSTI is a business accelerator and incubator dedicated to leveraging resources to help science and technology entrepreneurs commercialize their discoveries.
- 1997-1998 Program Activities Committee - Medical Scientist Training Program
Responsible for organizing meetings and speakers throughout the academic year.
- 1997 Retreat Coordinator – Medical Scientist Training Program
- 1996 Representative - University of Michigan Medical School Graduate Programs.
Responsible for providing information and recruiting applicants from the Minority Access to Research Careers Fellows (MARC) and Minority Biomedical Research Support scholars (MBRS) at the National Minority Research Symposium held in Miami, Florida.
- 1996 Member, Medical Intern
Summer Medical Institute, Philadelphia, Pennsylvania
A student operated project sponsored by Medical Campus Outreach, Esperanza Health Clinic, and the City of Philadelphia to provide immunizations in the most medically underserved communities in northern Philadelphia.

Activities & Community Service

- Spring Break 2001 Tijuana Christian Mission, Tijuana, Mexico.
Participated on volunteer team performing construction projects at an orphanage.

- Spring Break
2000 Tijuana Christian Mission, Tijuana, Mexico.
Participated on volunteer team to assist in construction of new buildings for an orphanage.
- 1992 - 2000 University of Michigan Tae Kwon Do Club
1st Dan -black belt
- Assisted in teaching forms and techniques to lower ranking members.
 - Third place trophy-State Tournament 1992.
 - Silver Medal-Regional Tournament 1993.
 - Two gold medals and a bronze medal at promotion exams.
- 1992 - 1993 University of Michigan Men's Glee Club - *Tenor II*
One of ten members who performed at Carnegie Hall with the Manhattan Philharmonic and select choirs from around the country under the direction of Jerry Blackstone, Ph.D., Director of the Michigan Men's Glee Club, May 1993.
- 1988 - 1991 Princeton University Glee Club – *Bass I & II*
- Successfully auditioned to participate on a six week European tour that included performances at the Basilica Di San Marco in Venice, Italy; Notre Dame in Paris, France; and a recording at Jesutenkirche in Innsbruck, Austria.
 - Elected Treasurer for 1990 academic year