

Department of Mechanical Engineering
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Bucknell University
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EDUCATION

Ph.D., Mechanical Engineering

Colorado State University (Fort Collins, CO) 2017
Dissertation: Finite element analysis of skeletal muscle: A validated approach to modeling muscle force and intramuscular pressure.

B.S., Engineering

Trinity College (Hartford, CT) 2011

PROFESSIONAL APPOINTMENTS

Bucknell University (Lewisburg, PA)

2017 – Present

Assistant Professor

John P and Mary Jane Swanson Professor of Engineering and the Sciences

Department of Mechanical Engineering

PUBLICATIONS

Refereed Journal Articles

15. Wheatley, B.B. (2020). Investigating Passive Muscle Load Sharing with Computational Modeling and Biaxial Stretch. In review.

14. Vaidya, A.J. & Wheatley, B.B. (2020). An experimental and computational investigation of the effects of volumetric boundary conditions on the compressive mechanics of passive skeletal muscle. *Journal of the Mechanical Behavior of Biomedical Materials*. <https://doi.org/10.1016/j.jmbbm.2019.103526>

13. Sinha, N., Cornell, M., Wheatley, B., Munley, N. & Seeley, M. (2019). Looking Through a Different Lens: Patient Satisfaction with Telemedicine in Delivering Pediatric Fracture Care. *Journal of the American Academy of Orthopaedic Surgeons Global Research & Reviews*. 3(9), e(100). doi: 10.5435/JAAOSGlobal-D-19-00100

12. Wolynski, J., Wheatley, B.B., & Haut Donahue, T.L. (2019). Finite Element Analysis of the Jaipur Foot: Implications for Design Improvement. *Journal of Prosthetics & Orthotics*. doi: 10.1097/JPO.0000000000000253

11. Wheatley, B.B., Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2018). Modeling Skeletal Muscle Stress and Intramuscular Pressure: A Whole Muscle Active-Passive Approach. *Journal of Biomechanical Engineering*. 140(8), 081006. doi: 10.1115/1.4040318

10. Teater, R.H., Fischenich, K.M., **Wheatley, B. B.**, Abrams, L., Sorby, S.A., Singh Mali, H., Jain, A., & Haut Donahue, T.L. (2018). Assessment of the compressive and tensile mechanical properties of materials used in the Jaipur Foot prosthesis. *Prosthetics & Orthotics International*. doi: 10.1177/0309364618767143
9. **Wheatley, B.B.**, Fischenich, K.M., Abrams, L.A., Sorby, S.A., Singh Mali, H., Jain, A. K., & Haut Donahue, T.L. (2017). An International Fellowship Experience for Engineering Undergraduates: Improving Technical, Teamwork, and Cultural Competency. *International Journal of Engineering Education*. 33(4), 1189-1198.
8. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., Haut Donahue, T.L. (2017). A validated model of passive skeletal muscle to predict force and intramuscular pressure. *Biomechanics and Modeling in Mechanobiology*. 16(3), 1011-1022. doi: 10.1007/s10237-016-0869-z.
7. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2017). A case for poroelasticity in skeletal muscle finite element analysis: experiment and modeling. *Computer Methods in Biomechanics and Biomedical Engineering*. 20(6), 598-601. doi: 10.1080/10255842.2016.1268132.
6. Drake, A.M., Haut Donahue, T.L., Stansloski, M., Fox, K., **Wheatley, B.B.**, & Donahue, S. W. (2016). Horn and horncore trabecular bone of bighorn sheep rams absorbs impact energy and reduces brain cavity accelerations during high impact ramming of the skull. *Acta Biomaterialia*. 136(11), 41-50. doi:10.1016/j.actbio.2016.08.019
5. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2016). How does tissue preparation affect skeletal muscle transverse isotropy? *Journal of Biomechanics*. 49 (13): 3056–3060. doi:10.1016/j.jbiomech.2016.06.034.
4. **Wheatley, B.B.**, Pietsch, R.B., Haut Donahue, T.L., & Williams, L.N. (2016). Fully non-linear hyper-viscoelastic modeling of skeletal muscle in compression. *Computer Methods in Biomechanics and Biomedical Engineering*. 19(11), 1181-1189. doi:10.1080/10255842.2015.1118468
3. **Wheatley, B.B.**, Morrow, D.A., Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2016). Skeletal muscle tensile strain dependence: hyperviscoelastic nonlinearity. *Journal of the Mechanical Behavior of Biomedical Materials*. 53, 445-454. doi:10.1016/j.jmbbm.2015.08.041
2. **Wheatley, B.B.**, Fischenich, K.M., Button, K.D., Haut, R.C., & Haut Donahue, T.L. (2015). An optimized transversely isotropic, hyper-poro-viscoelastic finite element model of the meniscus to evaluate mechanical degradation following traumatic loading. *Journal of Biomechanics*. 48(8), 1454-1460. doi:10.1016/j.jbiomech.2015.02.028
1. Pietsch, R., **Wheatley, B.B.**, Haut Donahue, T.L., Gilbrech, R., Prabhu, R., Liao, J., & Williams, L.N. (2014). The anisotropic compressive properties of porcine muscle tissue. *Journal of Biomechanical Engineering*. 136(11), 111003. doi:10.1115/1.4028088

Refereed Conference Papers

5. **Wheatley, B. B.** (2020) Investigating the Mechanics of Human-Centered Soft Robotic Actuators with Finite Element Analysis. *Appropriate Finite Element Analysis in Technical Engineering: Teaching Best Practices Through Simulation*. Montreal, Canada. In review.

4. **Wheatley, B.B.**, Miskioglu, E., Christou, E., Tymvios, N. (2020) Pre and Post Tenure: Perceptions of Requirements and Impediments for Mechanical Engineering and Mechanical Engineering Technology Faculty. *American Society of Engineering Education*. Montreal, Canada. In review.
3. Buffinton, K. B., **Wheatley, B.B.**, Habibian, S., Shin, J., Cenci, B.H., & Christy, A.E. (2020) Investigating the Mechanics of Human-Centered Soft Robotic Actuators with Finite Element Analysis. *RoboSoft*. New Haven, CT. In review.
2. **Wheatley, B.B.**, Fischenich, K.M., Abrams, L.A., Sorby, S.A., Singh Mali, H., Jain, A.K., & Haut Donahue, T.L. (2017) Improvement of an International Research Experience: Year Two. *American Society of Engineering Education*. Columbus, OH.
1. **Wheatley, B.B.**, Haut Donahue, T.L., & Catton, K.B. (2017) An Active Learning Environment to Improve First-Year Mechanical Engineering Retention Rates and Software Skills. *American Society of Engineering Education*. Columbus, OH.

Conference Proceedings

24. Vaidya, A.J., & **Wheatley, B.B.** (2020). Development and Implementation of Volumetric Compression Relaxation Testing of Skeletal Muscle. *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Vail, CO.
23. Grega, K.L., Fu, C., & **Wheatley, B.B.** (2020). Biaxial Tensile Mechanics of Aponeurosis Tissue. *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Vail, CO. In review.
22. **Wheatley, B.B.** & Fu, C. (2020) The Role of Biaxial Stretch in Elucidating Passive Muscle Mechanics. *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Vail, CO. In review.
21. **Wheatley, B.B.**, Yancey, M.E., & Seeley, M.A. (2020). A Musculoskeletal-Finite Element Framework for Modeling the Effect of Femoral Anteversion on Knee Extensor Muscle Force and Anterior Knee Mechanics. *CAMS-KNEE OpenSim Workshop and Conference*. Zurich, Switzerland. Poster Award Runner-Up.
20. Nester J., Torino D., Sylvestre D., Ney S., **Wheatley B.**, Seeley M. (2019). Risk of Reoperation After Primary ACL Reconstruction in Pediatric Patients. *Eastern Orthopaedic Association Annual Conference*, West Palm Beach, FL.
19. Vaidya, A.J. & **Wheatley, B.B.** (2019). Effects of Volumetric Boundary Conditions on the Compressive Mechanics and Modeling of Passive Skeletal Muscle. *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Seven Springs, PA. BS Level Competition 2nd Place.
18. Grega, K. L. & **Wheatley, B.B.** (2019). Determination of the Linear Viscoelastic Behavior of Aponeurosis. *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Seven Springs, PA.
17. **Wheatley, B.B.**, Yancey, M.E., & Seeley, M.A. (2019) Patellofemoral Contact Mechanics in Nail-Patella Syndrome and High Femoral Anteversion Morphology – Finite Element Modeling. *The Orthopaedic Research Society*. Austin, TX.
16. Vaidya, A.J. & **Wheatley, B.B.** (2018). Effects of Boundary Conditions on the Stress Relaxation of Passively Compressed Skeletal Muscle. *Biomedical Engineering Society Annual Meeting*. Atlanta, GA.
15. Geswell M., Sinha N., **Wheatley B.B.**, Mirenda, W.M. & Seeley M.A. (2018)

Teaching the infant hip exam: A novel approach. *Eastern Orthopaedic Association Annual Conference*. Amelia Island, FL.

14. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2018). Finite Element Analysis of Intramuscular Pressure in Passive *in Vivo* Human Skeletal Muscle. *World Congress of Biomechanics*. Dublin, Ireland. Oral Presentation.
13. **Wheatley, B.B.** (2018). Investigating the Variability of Passively Stretched Skeletal Muscle with a Functional Morphological Fiber Model. *World Congress of Biomechanics*. Dublin, Ireland.
12. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2017). Finite Element Analysis of Intramuscular Pressure in the Human Tibialis Anterior. *American Society of Biomechanics*. Boulder, CO. Poster Presentation.
11. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2017). Finite Element Modeling of Active Skeletal Muscle: Muscle Force and Intramuscular Pressure. *Summer Biomechanics, Bioengineering, and Biotransport Conference*. Tucson, AZ.
10. Kaufman, K.R., Go, S. A., O'Connor, S.A., **Wheatley, B. B.**, Litchy, W. J., Haut Donahue, T.L., Odegard, G.M., Ward, S.R., & Lieber, R.L. (2016). Quantitative Muscle Force Measurement using Intramuscular Pressure. *Biomedical Engineering Society Annual Meeting*. Minneapolis, MN.
9. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2016). A Novel and Validated Finite Element Model of Passively Stretched Skeletal Muscle. *European Society of Biomechanics*. Lyon, France.
8. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2016). Skeletal Muscle Permeability: Direct Experimental Evaluation and Modeling Implications. *Summer Biomechanics, Bioengineering, and Biotransport Conference*. National Harbor, MD.
7. **Wheatley, B.B.**, Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2016). Anisotropy and Rigor Effects of Skeletal Muscle. *The Orthopaedic Research Society*. Lake Buena Vista, FL.
6. **Wheatley, B.B.**, Morrow, D.A., Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2015). Predicting the Stress and Intramuscular Pressure Response of Whole Skeletal Muscle Through Optimized Finite Element Analysis. *Summer Biomechanics, Bioengineering and Biotransport Conference*. Snowbird Resort, UT.
5. **Wheatley, B.B.**, Pietsch, R., Donahue, T.L., & Williams, L.N. (2015). Numerical Modeling of Skeletal Muscle Under High Strain and Stress Relaxation Compression Conditions. *Summer Biomechanics, Bioengineering and Biotransport Conference*. Snowbird Resort, UT.
4. **Wheatley, B.B.**, Morrow, D.A., Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2014). Inverse Finite Element Analysis for Poroelastic Material Properties of Excised Skeletal Muscle. *World Congress of Biomechanics*. Boston, MA.
3. Drake, A.M., **Wheatley, B.B.**, Kaufman, K.R., & Haut Donahue, T.L., (2014) Hydraulic Permeability of Rabbit Muscle Transverse to Contraction Direction. *Rocky Mountain Regional American Society of Biomechanics*. Estes Park, CO.
2. **Wheatley, B.B.**, Fischenich, K.M., Haut, R.C., & Haut Donahue, T.L. (2014) Mechanical Properties of Healthy and Damaged Menisci through Finite Element Analysis of Indentation. *The Orthopaedic Research Society*. New Orleans, LA.

1. **Wheatley, B.B.**, Morrow, D.A., Odegard, G.M., Kaufman, K.R., & Haut Donahue, T.L. (2013). Poroelastic Material Properties of Skeletal Muscle through Inverse Finite Element Method. *Rocky Mountain Regional American Society of Biomechanics*. Estes Park, CO.

PubMed:

https://www.ncbi.nlm.nih.gov/sites/myncbi/1vi_od97smYQJ/bibliography/45973042/public/?sort=date&direction=ascending

Google Scholar:

<https://scholar.google.com/citations?user=JOaYOUIAAAAJ&hl=en&oi=sra>

HONORS AND AWARDS

Visiting Assistant Professor

Stanford University, OpenSim Visiting Scholars Program 2019

John P. and Mary Jane Swanson Professor of Engineering and the Sciences

Bucknell University 2017 – 2019

Government of Ireland Postdoctoral Fellowship (Declined)

Irish Research Council 2017 – 2019

PhD Competition Finalist - Tissue Mechanics and Characterization

Summer Biomechanics, Bioengineering, and Biotransport Conference 2017

Best Graduate Student Podium Presentation Award

Rocky Mountain American Society of Biomechanics 2017

College of Engineering Graduate Teaching Fellowship

Colorado State University 2016 – 2017

Global Impact Research Top Scholar

Colorado State University Graduate Student Showcase 2015

Shrake Culler Scholarship

Colorado State University 2015

Joseph L. Guire Memorial Scholarship

Colorado State University 2012

GRANTS

Bucknell University

4. Toyota Research Institute 2019 – 2020

Subcontract to TRI-UM Project: "Don't Bite the Hand that Feeds You: Soft Robotics for the Eldercare II."

Role: co-PI Award Total: \$30,055 (Awarded)

3. Bucknell-Geisinger Research Initiative 2019 – 2021

Characterization and Modeling of Miserable Malalignment Syndrome Lower Limb Biomechanics

Role: PI Award Total: \$100,000 (Awarded)

2. National Science Foundation Major Research Instrumentation 2018 – 2019
Acquisition of a Planar Biaxial Material Testing System for Enhancement of Research
and Teaching at Bucknell University

Role: PI Award Total: \$123,789 (Awarded)

1. Bucknell-Geisinger Research Initiative 2018 – 2019
Computational Modeling of Pediatric High Femoral Anteversion and Knee Biomechanics

Role: PI Award Total: \$19,947 (Awarded)

CAMPUS TALKS

Western Michigan University 2019
From Computation to the Clinic: Improving Health with Musculoskeletal Biomechanics
Simulations

Stanford University 2019
OpenSim Visiting Scholars Presentation at Neuromuscular Biomechanics Laboratory

Bucknell University
ASME Teacher Talk 2017
Admitted Students Open House 2018, 2019

TEACHING EXPERIENCE

Bucknell University
MECH 302 – Finite Element Analysis
MECH 471 – Nonlinear Solid Mechanics
ENGR 100 – Exploring Engineering

Colorado State University
The Institute for Learning and Teaching – Teaching Certificate Program 2016 – 2017
MECH 103 – Introduction to MECH (Graduate Teaching Fellow) 2016 – 2017
MECH 495 – Independent Study, The Jaipur Foot (Graduate Instructor) 2016 – 2017

RESEARCH EXPERIENCE

Bucknell University 2017 – Present
Principal Investigator, Mechanics and Modeling of Orthopaedic Tissues Laboratory

Colorado State University 2012 – 2017
Graduate Research Assistant, Soft Tissue Mechanics Laboratory

480 Biomedical, Inc. (Watertown, MA)
Engineering Intern, Design Team

2011 – 2012

SERVICE TO PROFESSION

Peer Reviewer

Acta Biomaterialia	2019 – Present
PLOS ONE	2018 – Present
Journal of Biomechanics	2017 – Present
Journal of the Mechanical Behavior of Biomedical Materials	2017 – Present
Journal of Biomechanical Engineering	2016 – Present
Summer Biomechanics, Bioengineering, and Biotransport Conference	2019 – Present
American Society of Engineering Education Annual Conference	2016 – Present
Advances in Engineering Education	2016 – Present

Outreach

Lewisburg Children’s Museum Muscle Madness	2019
American Society of Biomechanics National Biomechanics Day	2016

SERVICE TO UNIVERSITY

Bucknell University

Graduate Student Advisor and Graduate Committee Liaison Department of Mechanical Engineering	2018 – Present
Team Mentor – Men’s and Women’s Cross Country	2018 – Present
Mechanical Engineering Senior Design Panel	2017 – 2018
Interdisciplinary Senior Design Panel	2017 – Present

Colorado State University

Graduate Student Council Vice President of Finance	2015 – 2017
Mechanical Engineering Department Representative	2015 – 2017
Mechanical Engineering Graduate Ambassador	2016 – 2017
Colorado State University Graduate Showcase Moderator/Organizer – “Finding your perfect post-doc” workshop	2015
Moderator/Organizer – “Tools for Graduate Student Success” workshop	2016

RESEARCH STUDENTS MENTORED OR ADVISED

Bucknell University

Emily Tully – Mechanical Engineering	2020 – Present
Olivia Dyer – Cell Bio/Biochemistry	2020 – Present

Thomas Matsumura – Neuroscience	2019 – Present
Kristen Fu – Mechanical Engineering	2019 – Present
Ruth Segall – Cell Bio/Biochemistry	2019 – Present
Elyssa Penson – Mechanical Engineering	2019
Anurag Vaidya – Biomedical Engineering	2018 – Present
Keith Grega – Biomedical Engineering	2018 – Present
Sai Pranav Rallabhandi – Mechanical Engineering	2018
Joelle Andres-Beck – Mechanical Engineering	2018
Margo Yancey – B.S., Mechanical Engineering	2018 – 2019
Christine Bendzinski – B.S., Cell Bio/Biochemistry	2017 – 2018

Colorado State University

Aaron Drake – B.S., M.S., Mechanical Engineering	2013 – 2015
Alex Tomsick – B.S., Mechanical Engineering	2014 – 2015

PROFESSIONAL MEMBERSHIPS

American Society for Engineering Education	2018 – Present
Orthopaedic Research Society	2018 – Present
American Society of Biomechanics	2014 – Present
Association of Mechanical Engineers	2012 – Present
European Society of Biomechanics	2016, 2018 – Present