

Anthony H. Le

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Education

PhD in Biomedical Engineering

University of Utah

Expected Dec 2025

Salt Lake City, UT, USA

- Dissertation: "Application of Physics-Informed Neural Networks-Based Control for Replicating 3D Foot and Ankle Biomechanics"
Advisor: Dr. Amy L. Lenz
Committee Members: Drs. Health B. Henninger, Lucas H. Timmins, Jeffrey A. Weiss, Robert W. Hitchcock
- Honors/Leadership: Vice President/Treasurer, American Society of Biomechanics Utah Student Chapter; Treasurer, BME Graduate Student Advisory Committee

MS in Bioengineering, Minor in Robotics

Oregon State University

Dec 2020

Corvallis, OR, USA

- Thesis: "Biomechanical Modeling of Isometric Muscle-Tendon Force Generation Through Tendons Coupled in Parallel and a Passive Differential Mechanism"
Co-Advisors: Drs. Ravi Balasubramanian and James D. Sweeney
Committee Members: Drs. William D. Smart, Adam Z. Higgins, David P. Cann
- Honors/Leadership: Co-Founder & Co-President, Robotics Graduate Student Association; BioE Chairman, CBEE Graduate Student Association; OMSI Science Communication Fellowship; ORS Blue Ribbon Poster Award; ORISE Research Fellowship

BS in Chemistry, Minor in Applied Mathematics

Wofford College

May 2015

Spartanburg, SC, USA

- Honors/Leadership: Paul Calvert Thomas Endowed Chemistry Scholarship; Dean's List; President, Sigma Nu Fraternity; Co-Chair, Orientation Staff; Alpha Phi Omega; Peer Tutor
 - Study Abroad: Queen Mary University of London, London, England; Buenos Aires, Argentina; Little Cayman, Cayman Islands
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Research Experiences

Graduate Research Assistant

Orthopaedic Research Laboratory, University of Utah School of Medicine

Jan 2022–Present

Salt Lake City, UT, USA

- Developed a biorobotic simulator for replicating motion in a human cadaveric foot and ankle model using an industrial robot driven with *in vivo* biplane fluoroscopy data (Fanuc M-20iA)
- Evaluated the subtalar kinematic compensations after tibiotalar arthrodesis and total ankle replacement
- Integrated muscle actuators and a ground reaction force plate to the biorobotic simulator and validated *in vitro* fibula and subtalar kinematics against *in vivo* observations
- Performed computational statistical shape modeling of the foot and ankle to evaluate the morphological influences on ankle kinematics after tibiotalar arthrodesis and total ankle replacement (ShapeWorks)
- Examined the effects of sex and laterality on tibial morphology using computational statistical shape modeling (ShapeWorks)

Research Analyst

Orthopaedic Research Laboratory, University of Utah School of Medicine

Oct–Dec 2021

Salt Lake City, UT, USA

- Conducted literature reviews on subtalar joint kinematics, kinetics, morphology, and instability; ankle arthrodesis; total ankle replacement; and robotic simulators in biomechanics
- Designed a testing fixture for attaching a human cadaveric tibia to an industrial robot end effector and bone pins for mounting infrared marker arrays for motion capture

Musculoskeletal Tissue Biomechanist Research Fellow

DoD-VA Extremity Trauma and Amputation Center of Excellence, Walter Reed NMMC

Mar 2020–Sept 2021

Bethesda, MD, USA

- Compared biomechanical properties of high-tensile strength suture vs. high-tensile strength tape across two different stitching techniques under cyclic loading in human cadaveric tendons
- Developed linear mixed model with experimental data that revealed how high-tensile strength tape in a Krackow stitch was the best suture construct for tendon repair (R)
- Evaluated biomechanics of ulnar collateral ligament reconstruction with different bone tunnel orientations under cyclic valgus

- loading and load-to-failure testing in human cadaveric elbows
- Assessed effects of posterior thoracic spine fusions on 3D vertebral kinematics in flexion-extension, lateral bending, and axial rotation motions using pure torque bending tests and motion capture in human cadaveric spines
- Demonstrated changes in peak contact pressures and pressure locations on tibial plateau in knee joint before and after ACL injury and reconstruction at various joint angles under static and dynamic loads in human cadaveric knees

Graduate Research Assistant

Sept 2016–Mar 2020

Robotics & Human Control Systems Laboratory, Oregon State University MIME

Corvallis, OR, USA

- Formulated IACUC-approved Animal Care and Use Protocols for validating novel implantable passive mechanisms in chicken and rabbit models
- Established design of experiment to measure isometric muscle force generation, joint torques, and joint kinematics using intramuscular functional electrical stimulation, load cells, and motion capture in live chicken and rabbit models
- Fabricated custom fixtures to interface miniature load cells with chicken foot anatomy in order to measure multiple toe tip forces simultaneously
- Built biomechanical models for simulating isometric muscle force generation through two tendons coupled in parallel and a passive differential mechanism using direct stiffness method (MATLAB)
- Managed 2 undergraduate research assistants in designing apparatuses and processing kinetic and kinematic data (MATLAB, R)

Undergraduate Research Assistant

Apr–Sept 2016

Tomasino Laboratory, Oregon State University Food Science and Technology

Corvallis, OR, USA

- Analyzed organic chemistry of grapes juice to predict resultant wine characteristics in production using high-throughput FT-IR and FT-NIR spectroscopy
- Isolated and purified polysaccharides from wines and grape pomace to evaluate value-added mouthfeel profiles for R&D projects related to the Dark Horse Wine brand using high-throughput HPLC
- Operated resin column in down-flow configuration to extract quercetin glycosides and other polyphenols from Muscat grape juice for white wine product development projects

Industry Experiences

Chemistry Research Intern

Jun–Nov 2015

E. & J. Gallo Research Laboratory

Modesto, CA, USA

- Analyzed the organic chemistry of grapes using high-throughput FT-IR and FT-NIR spectroscopy
- Isolated and purified polysaccharides from wines and grape pomace for value-added mouthfeel projects
- Implemented a resin column in down-flow configuration to extract quercetin glycosides and other polyphenols from Muscat grape juice for product development projects

Teaching Experiences

CBEE 414: Process Engineering Lab

Sept–Dec 2019

Graduate Teaching Assistant

Professors: Natasha Mallette, Elain Fu, Kaichang Li

- Held writing help sessions for 4 hours per week for students looking to improve their writing skills for more concise and effective dissemination of their work
- Graded assignments ranging from short 1-page writing assignments to long technical lab reports (Canvas, SpeedGrader)

Peer-Reviewed Journal Publications

- DF Colantonio, **AH Le**, AJ Pisano, JM Chung, SC Wagner, DR Fredericks, WB Roach, CD Schlaff, A Dill, MD Helgeson. "Hooks Versus Pedicle Screws at the Upper Instrumented Level: An *In Vitro* Biomechanical Comparison," *Spine*, *Accepted Nov 2022*
- DF Colantonio, RK Kicklighter, **AH Le**, MA Nowicki, MA Posner, LF Zhou, SM Gee. "Subcortical Backup Tibial Fixation in ACL Reconstruction has Similar Maximal Strength to Current Techniques," *Arthrosc Sports Med Rehabil*, *Accepted Nov 2022*

3. **AH Le**, DF Colantonio, DR Fredericks, JM Chung, WB Roach, AJ Pisano, MD Helgeson, SC Wagner. "Effects of Drill Technique and Burr Size on Insertional Torque and Pullout Strength of Lateral Mass Screw Fixation," *N Am Spine Soc J*, Submitted Oct 2022
4. DF Colantonio, CJ Tucker, TP Murphy, PK Mescher, **AH Le**, RM Putko, ER Holm, R Weishar, TK Vippra, TN Rubic, ES Chang. "All-Suture Suspensory Button Has Similar Biomechanical Performance to Metal Suspensory Button for Onlay Subpectoral Biceps Tenodesis," *Arthrosc Sports Med Rehabil*, In Press Oct 2022
5. ES Chang, **AH Le**, AM Looney, WB Roach, MD Helgeson, DM Clark, DR Fredericks, S Nagda. "Biomechanical Comparison of Anatomic Restoration of the Ulnar Footprint Versus Traditional Ulnar Tunnels in Ulnar Collateral Ligament Reconstruction," *Am J Sports Med*, Published Dec 2021
6. DF Colantonio, **AH Le**, LE Keeling, SE Slaven, T Vippra, MD Helgeson, ES Chang. "Intramedullary Unicortical Button and All-Suture Anchors Provide Similar Maximum Strength for Onlay Distal Biceps Tendon Repair," *Arthroscopy*, Published Jul 2021
7. **AH Le**, WB Roach, TC Mauntel, BD Hendershot, MD Helgeson, DF Colantonio, DR Fredericks, SE Slaven, AJ Pisano, LE LeClere. "A Biomechanical Comparison of High-Tensile Strength Tape Versus High-Tensile Strength Suture for Tendon Fixation Under Cyclic Loading," *Arthroscopy*, Published Apr 2021
8. GR Browning, **AH Le**, JJ Warnock, R Balasubramanian. "An Investigation of a Novel Tendon Transfer Surgery for High Median-Ulnar Nerve Palsy in a Chicken Model," *J Invest Surg*, Published Oct 2017

Conference Presentations

Podiums

1. PK Mescher, TP Murphy, **AH Le**, DF Colantonio, D Rodkey, CH Renninger. "Biomechanical Evaluation of Fully Versus Partially Threaded Cannulated Screw Fixation of Transcervical Femoral Neck Fractures," *64th Annual Meeting of the Society of Military Orthopaedic Surgeons*, Scottsdale, AZ, USA, Dec 2022
2. JL Carver, **AH Le**, DF Colantonio, WB Roach, CJ Tucker, JF Dickens, BD Hendershot, MD Helgeson, TC Mauntel. "Knee Joint Peak Contact Pressure Location Following ACL and Meniscus Injuries and Surgical Treatments," *2022 Womack Army Medical Center Research Symposium*, Fort Bragg, NC, USA, May 2022
3. PK Mescher, TP Murphy, **AH Le**, DF Colantonio, D Rodkey, CH Renninger. "Biomechanical Evaluation of Fully Versus Partially Threaded Cannulated Screw Fixation of Transcervical Femoral Neck Fractures," *2022 Annual Meeting of the Orthopaedic Trauma Association*, Tampa, FL, USA, Oct 2022
4. AE Lundy, DF Colantonio, **AH Le**, R Lee, AS Piscoya, E Holm, TT Eckel. "Biomechanical Changes in the Ankle Joint After Syndesmosis and Deltoid Injury and Subsequent Repairs in a Cadaveric Model," *2022 Annual Meeting of the American Orthopaedic Foot and Ankle Society*, Quebec City, QC, CA, Sept 2022
5. AE Lundy, DF Colantonio, **AH Le**, R Lee, AS Piscoya, E Holm, TT Eckel. "Biomechanical Changes in the Ankle Joint After Syndesmosis and Deltoid Injury and Subsequent Repairs," *2022 Annual Meeting of the Arthroscopy Association of North America*, San Francisco, CA, USA, May 2022
6. PK Mescher, TP Murphy, **AH Le**, DF Colantonio, D Rodkey, CH Renninger. "Biomechanical Evaluation of Fully Versus Partially Threaded Cannulated Screw Fixation of Transcervical Femoral Neck Fractures," *75th Annual Meeting of the Virginia Orthopaedic Society*, White Sulphur Springs, WV, USA, Apr 2022
7. AE Lundy, DF Colantonio, **AH Le**, R Lee, AS Piscoya, E Holm, TT Eckel. "Biomechanical Changes in the Ankle Joint After Syndesmosis and Deltoid Injury and Subsequent Repairs," *2022 Annual Meeting of the American Orthopaedic Society for Sports Medicine*, Chicago, IL, USA, Mar 2022
8. ES Chang, **AH Le**, AM Looney, WB Roach, MD Helgeson, DM Clark, DR Fredericks, S Nagda. "Biomechanical Comparison of Anatomic Restoration of the Ulnar Footprint Versus Traditional Ulnar Tunnels in Ulnar Collateral Ligament Reconstruction," *2022 Annual Meeting of the American Orthopaedic Society for Sports Medicine/2022 Specialty Day*, Chicago, IL, USA, Mar 2022
9. AE Lundy, DF Colantonio, **AH Le**, R Lee, AS Piscoya, E Holm, TT Eckel. "Tibiotalar Contact Pressures and Torsional Stability following Syndesmosis and Deltoid Ligament Injury and Repair," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons*, Olympic Valley, CA, USA, Dec 2021
10. DF Colantonio, **AH Le**, DR Fredericks, JM Chung, A Dill, AJ Pisano, MD Helgeson, A Sebastian, SC Wagner, S

- Rabin. "Effects of Drill Technique and Burr Size on Insertional Torque and Pullout Strength of Lateral Mass Screw Fixation," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons, Olympic Valley, CA, USA, Dec 2021*
11. TP Murphy, DF Colantonio, **AH Le**, SC Wagner, DR Fredericks, WB Roach, JM Chung, AF Pisano, MD Helgeson. "Biomechanical Comparison of Anterior Plate Fixation vs. Integrated Fixation Cage for Anterior Cervical Discectomy and Fusion," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons, Olympic Valley, CA, USA, Dec 2021*
 12. TP Murphy, DF Colantonio, **AH Le**, DR Fredericks, CD Schlaff, E Holm, MD Helgeson, SC Wagner. "Biomechanical Analysis of the Cervicothoracic Junction in Long Posterior Cervical Fusion Constructs," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons, Olympic Valley, CA, USA, Dec 2021*
 13. RE Kinnison, DF Colantonio, **AH Le**, MA Posner, MA Nowicki, SM Gee, RM Putko. "Novel Intramedullary Suture Button Technique has Similar Maximal Strength to Bicortical Post for Secondary ACL Graft Fixation," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons, Olympic Valley, CA, USA, Dec 2021*
 14. ES Chang, DF Colantonio, **AH Le**, AM Looney, WB Roach, DM Clark, DR Fredericks, MD Helgeson, S Nagda. "Biomechanical Comparison of Anatomic Restoration of the Ulnar Footprint vs. Traditional Ulnar Tunnels in Ulnar Collateral Ligament Reconstruction," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons, Olympic Valley, CA, USA, Dec 2021*
 15. DF Colantonio, **AH Le**, AJ Pisano, SC Wagner, DR Fredericks, WB Roach, CD Schlaff, MD Helgeson. "Hooks vs. Pedicle Screws at Upper Level of Long Fusion Constructs," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons, Olympic Valley, CA, USA, Dec 2021*
 16. DF Colantonio, **AH Le**, LE Keeling, SE Slaven, MD Helgeson, ES Chang, H Gibbs. "Biomechanical Comparison of Onlay Distal Biceps Repair: Intramedullary Button vs. All-Suture Anchors," *63rd Annual Meeting of the Society of Military Orthopaedic Surgeons, Olympic Valley, CA, USA, Dec 2021*
 17. DF Colantonio, **AH Le**, WB Roach, JM Chung, DR Fredericks, AJ Pisano, SC Wagner, MD Helgeson. "Posterior Thoracic Spine Construct Stiffness Under Cyclic Load: An *In Vitro* Biomechanical Comparison of Hooks vs. Pedicle Screws," *14th Annual Meeting of the Lumbar Spine Research Society, Virtual, Apr 2021*
 18. **AH Le**, WB Roach, TC Mauntel, BD Hendershot, MD Helgeson, AJ Pisano, LE LeClere. "An *In Vitro* Biomechanical Comparison of Suture Constructs for Acute Tendon Rupture Repairs Under Cyclic Loading," *62nd Annual Meeting of the Society of Military Orthopaedic Surgeons, Virtual, Dec 2020*
 19. **AH Le**, J Casebier, J Mandich, JJ Warnock, JD Sweeney, R Balasubramanian. "Evaluation of Postoperative Healing for Novel Tendon Transfer Surgery Using an Implantable Passive Mechanism: A Pilot *In Vivo* Study," *44th Annual Veterinary Orthopedic Society Conference, Snowbird, UT, USA, Mar 2017*

Posters

1. **AH Le**, HB Henninger, KN Bachus, AL Lenz. "Statistical Shape Modeling of the Tibia to Inform Mounting Position in a BioRobotic Foot and Ankle Simulator," *12th Annual Meeting of the Rocky Mountain American Society of Biomechanics, Estes Park, CO, USA, April 2022*
2. DF Colantonio, CJ Tucker, **AH Le**, PK Mescher, TP Murphy, RM Putko, E Holm, R Weishar, T Rubic, T Vippra, ES Chang. "Biomechanical Comparison of Novel All-Suture Button vs Metal Button for Subpectoral Biceps Tenodesis," *2022 Annual Meeting of the Arthroscopy Association of North America, San Francisco, CA, USA, May 2022*
3. TP Murphy, **AH Le**, DF Colantonio, DR Fredericks, JM Chung, WB Roach, AJ Pisano, MD Helgeson, SC Wagner. "Effects of Drill Technique and Burr Size on Insertional Torque and Pullout Strength of Lateral Mass Screw Fixation," *2022 Annual Meeting of the American Academy of Orthopaedic Surgeons, Chicago, IL, USA, Mar 2022*
4. TP Murphy, DF Colantonio, **AH Le**, DR Fredericks, CD Schlaff, E Holm, MD Helgeson, SC Wagner. "Biomechanical Analysis of the Cervicothoracic Junction in Long Posterior Cervical Fusion Constructs," *2022 Annual Meeting of the American Academy of Orthopaedic Surgeons, Chicago, IL, USA, Mar 2022*
5. **AH Le**, JD Sweeney, R Balasubramanian. "Changes in Tendon Network Configuration Influences Joint Moment-Angle Characteristics: Implications of Tendon Transfers," *1st Annual Oregon Bioengineering Symposium, Corvallis, OR, USA, Nov 2019*
6. **AH Le**, JJ Warnock, JD Sweeney, R Balasubramanian. "Clinical Assessment of Functional Recovery After a Novel Tendon Transfer Surgery in a Chicken Model," *2018 Military Health Systems Research Symposium, Kissimmee, FL, USA, Aug 2018*

7. **AH Le**, JD Sweeney, R Balasubramanian. "Biomechanical Analysis of Toe Extension After a Novel Tendon Transfer Surgery for Implantable Passive Mechanisms," *40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Honolulu, HI, USA, Jul 2018*
8. LM Cavalcanti, H Ling, **AH Le**, R Balasubramanian, VJ Mathews. "Improving Muscle Activation Efficiency of Functional Neuromuscular Stimulation Using a Passive Force-Scaling Implant," *43rd Neural Interfaces Conference, Minneapolis, MN, USA, Jun 2018*
9. **AH Le**, DS Russell, JJ Warnock, MK Larson, GR Browning, KA Fischer, JD Sweeney, R Balasubramanian. "Histopathological Healing Responses to a Novel Tendon Transfer Surgery in a Chicken Model," *2017 Military Health Systems Research Symposium, Kissimmee, FL, USA, Aug 2017*
10. **AH Le**, GR Browning, JJ Warnock, JD Sweeney, R Balasubramanian. "Evaluation of Gait Quality for a Novel Tendon Transfer Surgery in a Chicken Model," *13th Annual Northwest Biomechanics Symposium, Eugene, OR, USA, May 2017*

Workshops

1. **AH Le**, DS Russell, MK Larson, JJ Warnock, GR Browning, KA Fischer, JD Sweeney, R Balasubramanian. "Histopathological Analysis of Healing Responses to a Novel Tendon Transfer Surgery in a Chicken Model," *47th International ORS Musculoskeletal Biology Workshop, Sun Valley, ID, USA, Aug 2017*

Project Involvements

1. **Biomechanical Evaluation of Orthopaedic Procedures for Musculoskeletal Injuries in the Military**
Mar 2020–Sept 2021
Department of Defense, Department of Research Programs Graduate Medical Education Research
PI: Melvin D. Helgeson
2. **Design and Validation of Implantable Passive Mechanisms for Orthopaedic Surgery**
Sept 2016–Mar 2020
Department of Defense, Congressionally Directed Medical Research Programs
Award: W81XWH-16-1-0794
PI: Ravi Balasubramanian
Co-Is: Jennifer J. Warnock, James D. Sweeney, Francisco J. Valero-Cuevas, Buddy Ratner

Honors & Awards

Fellowships

Dean's Distinguished Graduate Fellowship (Declined) <i>University of California, Davis</i>	Apr 2021
Musculoskeletal Tissue Biomechanist Research Fellowship <i>Oak Ridge Institute for Science and Education</i>	Jan 2020
Science Communication Fellowship (Declined) <i>Oregon Museum of Science and Industry</i>	Nov 2018

Peer-Reviewed Publication Awards

Arthroscopy Journal Award for Basic Science Research Excellence (Runner-Up) <i>Arthroscopy: The Journal of Arthroscopic and Related Surgery</i>	Jan 2022
Blue Ribbon Poster Award <i>Orthopaedic Research Society</i>	Aug 2017

Professional Engagements

Journal Reviews

Arthroscopy: The Journal of Arthroscopic and Related Surgery 2021–Present

Society Memberships

Orthopaedic Research Society, *Member* 2017–2018
IEEE, *Student Member* 2017–2018
IEEE Engineering in Medicine and Biology Society, *Student Member* 2017–2018
American Chemical Society, *Member* 2011–2015

Training Courses

Fanuc Basic Programming, *Fanuc Corporation* Feb 2022
Series 793/MPT Introduction, *MTS Systems Corporation* June 2020
Series 793 Configuration, *MTS Systems Corporation* June 2020

University Engagements

American Society of Biomechanics Utah Student Chapter, *Vice President/Treasurer* 2022–Present
Utah BME Graduate Student Advisory Committee, *Treasurer* 2021–Present
Utah Graduate Women in Biomedical Engineering, *Member* 2021–Present
OSU CBEE Graduate Student Association, *BioE Chairman* 2017–2018
OSU Robotics Graduate Student Association, *Co-Founder & Co-President* 2016–2018

Volunteering Experiences

WeDo Lego Robotics, *OSU STEM Academy, Corvallis, OR* Apr 2016–Dec 2019
Boy & Girls Club, *Corvallis, OR* Apr–Sept 2016
Makers Club, *Corvallis-Benton County Public Library, Corvallis, OR* Apr–Sept 2016
Relay for Life, *Wofford College, Spartanburg, SC* Mar 2013, 2014, 2015
Habitat for Humanity, *Spartanburg, SC* Jan 2013, 2014

News & Press

OSU College of Engineering Sept 2019
Momentum Magazine Jun 2019

Technical Skills

- Statistical Modeling & Analysis (MATLAB, R)
- Data Processing & Analysis (MATLAB, R, Python)
- Data Visualization (MATLAB, ggplot2, Matplotlib)
- Motion Capture (OptiTrack, Optotrak, Vicon)
- 3D Kinematic Analysis (MATLAB, Motive, First Principles)
- 3D Computer Assisted Design (Solidworks, Fusion 360)
- Custom Fabrication (3D Printing, CNC)
- Graphic Design (Adobe Illustrator)
- Finite Element Analysis (FEBio)
- Medical Image Processing & Visualization (Mimics)
- Biomechanical Modeling (MATLAB)
- Biomaterial & Medical Device Testing (MTS Bionix)
- Robotic Testing & Manipulation (Fanuc M-20iA)
- Human Anatomy & Physiology
- Surgical Procedure Terminology (Orthopaedics)
- Medical Device Knowledge
- Design of Experiment
- Regulatory Protocol Writing & Review (ACUP, IRB)
- Word Processing (Word, \LaTeX)
- MS Office Suite (Word, Excel, PowerPoint)
- Technical Writing & Presentation
- Robot Operating System
- Linux, macOS, Windows