

Sarah Anne Roelker

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Department of Kinesiology
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EDUCATION

- Ph.D. 2017 **The Ohio State University**, Mechanical Engineering, Columbus, Ohio
Dissertation Title: *Differences in Lower Extremity Muscle Function and Coordination during Gait between Older and Young Adults*
- M.S. 2015 **The Ohio State University**, Mechanical Engineering, Columbus, Ohio
- B.S. 2012 **The Ohio State University**, Biomedical Engineering, Columbus, Ohio
Honors Thesis Title: *Time-to-Contact Measures Demonstrate Modulations of Postural Control during a Dynamic Lower Extremity Task.*

PROFESSIONAL EXPERIENCE

- 2020 - **Assistant Professor**
Neuromuscular Biomechanics Laboratory, Director
Department of Kinesiology
University of Massachusetts Amherst, Amherst, MA
- 2017-20 **Postdoctoral Research Fellow**
Neuromuscular Biomechanics Laboratory
The University of Texas at Austin, Austin, Texas
Advisor: Richard R. Neptune
- 2012-17 **Graduate Research Fellow**
Neuromuscular Biomechanics Laboratory
The Ohio State University, Columbus, Ohio
Advisor: Robert A. Siston
- 2010-12 **Undergraduate Research Assistant**
Sports Biomechanics Laboratory
The Ohio State University, Columbus, Ohio
Advisor: Ajit M.W. Chaudhari
- 2009 **Student Summer Intern**
Sports Medicine Biodynamics Center
Cincinnati Children's Hospital, Cincinnati, Ohio
Lab Director: Timothy E. Hewett

PUBLICATIONS (Peer reviewed, Schloemer is my maiden name)

- In Press* 1) Pew, CA, **Roelker, SA**, Klute, GK, Neptune, RR. Analysis of the Relative Motion between the Socket and Residual Limb in Transtibial Amputees while Wearing a Transverse Rotation Adapter. *J Appl Biomech.*
- 2020 2) **Roelker SA**, Caruthers EJ, Baker RK, Pelz NC, Chaudhari AMW, Siston RA. Effects of Optimization Technique on Simulated Muscle Activations and Forces. *J Appl Biomech.* 36(4):259-278, 2020.

- 2019 3) **Roelker SA**, Kautz SA, Neptune RR. Muscle Contributions to Mediolateral and Anteroposterior Foot Placement During Walking. *J Biomech.* 95:109310, 2019.
- 2019 4) **Roelker SA**, Bowden MG, Kautz SA, Neptune RR. Paretic propulsion as a measure of walking performance and functional motor recovery post-stroke: a review. *Gait Posture.* 68:6-14 2019.
- 2017 5) **Roelker SA**, Caruthers EJ, Baker RK, Pelz NC, Chaudhari AMW, Siston RA. Interpreting Musculoskeletal Models and Dynamic Simulations: Causes and Effects of Differences between Models. *Ann Biomed Eng.* 45(11):2635-2647, 2017.
- 2017 6) Cotter JA, Jamison ST, **Schloemer SA**, Chaudhari AMW. Do Neuromuscular Dentistry-Designed Mouthguards Enhance Dynamic Movement Ability in Competitive Athletes? *J Strength Cond Res.* 31(6):1647-1635, 2017.
- 2017 7) **Schloemer SA**, Thompson JA, Siler A, Thelen DG, Siston, RA. Age-Related Differences in Gait Kinematics, Kinetics, and Muscle Function: A Principal Component Analysis. *Ann Biomed Eng.* 45(3): 695-710, 2017.
- 2013 8) **Schloemer SA**, Cotter JA, Jamison ST, Chaudhari AMW. Time to Contact Measures Demonstrate Modulation of Postural Control during a Dynamic Lower Extremity Task. *Gait Posture.* 38:658-62, 2013.
- In Review 9) **Roelker SA**, Koehn RR, Caruthers EJ, Schmitt LC, Chaudhari AMW, Siston RA. The Effects of Age and Osteoarthritis on the Modular Control of Gait. *Clin Biomech.*
- In Preparation 10) **Roelker SA**, Schmitt LC, Chaudhari, AMW, Siston RA. Discover Your Potential: The Influence of Kinematics on a Muscle's Ability to Contribute to the Sit-to-Stand Transfer. *Peer J.*
- In Preparation 11) **Roelker SA**, Willson JD, DeVita P, Neptune RR. Muscle Contributions to Differences in Metabolic Cost and Joint Contact Forces between Skipping and Running. *J Biomech.*
- In Preparation 12) **Roelker SA**, Caruthers EJ, Schmitt LC, Chaudhari AMW, Siston RA. Modular Control of Walking Derived from Simulated Activation Patterns Differs from Electromyography-Derived Modules. *J Biomech.*

CONFERENCE PROCEEDINGS

- 2020 1) Koehn RR, **Roelker SA**, Schmitt LC, Chaudhari AMW, Siston RA. Modular Control and Patient Function in Individuals with Knee Osteoarthritis and Total Knee Arthroplasty. 44th Annual Meeting of the American Society of Biomechanics. August 4-7, 2020. (3 Minute Thesis finalist; podium)
- 2019 2) **Roelker SA**, Kautz SA, Neptune RR. Muscle Contributions to Mediolateral and Anteroposterior Foot Placement during Walking. XXVII Congress of the International Society of Biomechanics and 43rd Annual Meeting of the American Society of Biomechanics. Calgary, Canada. July 31 – August 4, 2019. (poster)
- 2019 3) **Roelker SA**, Kautz SA, Neptune RR. Muscle Contributions to Mediolateral Foot Placement during Straight-Line Walking. Gait & Clinical Movement Analysis Society 2019 Annual Conference. Frisco, Texas. March 26-29, 2019. (poster)
- 2018 4) **Roelker SA**, Caruthers EJ, Schmitt LC, Chaudhari AMW, Siston RA. Discrepancy between the Modular Control of Gait Derived from Experimental versus Simulated Activation Patterns. 42nd Annual Meeting of the American Society of Biomechanics.

- Rochester, Minnesota. August 8-11, 2018. (rapid podium)
- 2018 5) **Roelker SA**, Caruthers EJ, Schmitt LC, Chaudhari AMW, Siston RA. Modular Control of Gait in Healthy Older and Young Adults. 42nd Annual Meeting of the American Society of Biomechanics. Rochester, Minnesota. August 8-11, 2018. (poster)
- 2018 6) Koehn RR, **Roelker SA**, Leszcz EM, Baker RK, Caruthers EJ, Lewis JM, Freisinger GM, Schmitt LC, Chaudhari AMW, Siston RA. Post-Operative Function and Muscle Modules during Gait at 6 and 24 Months Following Total Knee Arthroplasty. 42nd Annual Meeting of the American Society of Biomechanics. Rochester, Minnesota. August 8-11, 2018. (rapid podium)
- 2018 7) Lee A, Jackson AM, Caruthers EJ, **Roelker SA**, Schmitt LC, Chaudhari AMW, Siston RA. Simulated Development of an Assistive Device to Aid Older Adults in Ascending Stairs. 42nd Annual Meeting of the American Society of Biomechanics. Rochester, Minnesota. August 8-11, 2018. (poster)
- 2017 8) **Schloemer SA**, Schmitt LC, Chaudhari, AMW, Siston RA. What's Your Potential? The Influence of Kinematics on a Muscle's Ability to Contribute to the Sit-to-Stand Transfer. 41st Annual Meeting of the American Society of Biomechanics. Boulder, Colorado. August 8-11, 2017. (thematic poster)
- 2016 9) **Schloemer SA**, Caruthers EJ, Baker RK, Pelz NC, Chaudhari AMW, Siston RA. Model Choice Could Change Clinical Interpretation of Simulation Results. 40th Annual Meeting of the American Society of Biomechanics. Raleigh, North Carolina. August 2-5, 2016. (thematic poster)
- 2016 10) **Schloemer SA**, Caruthers EJ, Baker RK, Pelz NC, Chaudhari AMW, Siston RA. Static Optimization vs. Computed Muscle Control Characterizations of Neuromuscular Control: Clinically Meaningful Differences? Biomechanics and Neural Control of Movement 2016 Conference. Mt. Sterling, Ohio. June 12-17, 2016. (poster)
- 2015 11) **Schloemer SA**, Thompson JA, Silder A, Thelen DG, Siston RA. Muscle Function Differences between Young and Old Adults during Gait. 39th Annual Meeting of the American Society of Biomechanics. Columbus, Ohio. August 5-8, 2015. (poster)
- 2013 12) **Schloemer SA**, Thompson JA, Schmitt LC, Best TM, Siston RA. Do Increased Muscle Forces Always Lead to Increased Contributions to Support and Progression during Gait? 37th Annual Meeting of the American Society of Biomechanics. Omaha, Nebraska. September 4-7, 2013. (poster)
- 2013 13) **Schloemer SA**, Cotter JA, Jamison ST, Onate, JA, Pan X, Chaudhari AMW. Time-to-Contact Independent of Side and Direction during Star Excursion Balance Test in Healthy Recreational Athletes. 60th Annual Meeting and 4th World Congress on Exercise is Medicine of the American College of Sports Medicine. Indianapolis, Indiana. May 28-June 1, 2013. #2857 (poster)
- 2011 14) **Schloemer SA**, Cotter JA, Jamison ST, Chaudhari AMW. Time to Contact Measures Demonstrate Modulation of Postural Stability during a Lower Extremity Dynamic Movement Task. 35th Annual Meeting of the American Society of Biomechanics. Long Beach, California, August 10-13, 2011. #250 (poster)

TEACHING

Assistant Instructor

2020

Fall Semester

Biomechanics

(KIN 430, University of Massachusetts Amherst)

I answered questions during the remote lectures, taught 2 lectures, developed homework and exam questions, and held office hours.

Guest Lecturer

2016

Fall Semester

Numerical Methods in Mechanical Engineering

(MECHENG 2850, The Ohio State University)

I developed original example problems and taught 5 lectures.

Teaching Assistant

2018

Fall Semester

Musculoskeletal Biomechanics

(ME 385 J 22, The University of Texas at Austin)

I helped coordinate all aspects of this advanced graduate course on modeling and simulation of human movement including teaching select lectures, assisting with in-class recitation sessions, serving as an OpenSim modeling consultant, and holding office hours.

2015-17

Fall & Spring
Semesters

Mechanical Engineering Undergraduate Research for Thesis

(MECHENG 4999, The Ohio State University)

I led sections of the class to provide feedback on students' oral presentations of their senior thesis in preparation for their oral defenses.

2015, 2016

Fall Semesters

Introduction to Musculoskeletal Biomechanics

(MECHENG 5700/6700, The Ohio State University)

I developed homework questions and the graduate level end-of-semester project in which students analyzed and compared the biomechanics of a healthy young adult to that of an older adult with knee osteoarthritis. I also held weekly office hours, assisted with recitation sessions, and graded exams.

2012, 2013, 2014

Fall Semesters

Introduction to Musculoskeletal Biomechanics

(MECHENG 6700, The Ohio State University)

I held weekly office hours, assisted with recitation sessions, and graded exams.

MENTORING

As a mentor of undergraduate and graduate students, I have assisted with conceptual and methodological project development, guided technical and statistical data analysis, revised conference abstracts, fellowship proposals, and theses drafts, and prepared students to effectively communicate their research by advising their preparation of oral presentations.

Graduate

2018-20

Former – Doctor of Philosophy (Mentored As a Post-Doctoral Research Fellow)

Lydia Brough, National Science Foundation Graduate Research Fellow

Mechanical Engineering, The University of Texas at Austin

Project: Relating post-stroke cortical function to modular control and biomechanical function

2018-20

Shelby Walford, National Science Foundation Graduate Research Fellow

Mechanical Engineering, The University of Texas at Austin

Project: Identification of biomechanical markers that predict upper extremity pain in manual wheelchair users

2019-20

Aude Lefranc, Mechanical Engineering, The University of Texas at Austin

Project: Biomechanics of front and back load carriage during walking in individuals with and without a transtibial amputation

Former – Master of Science (Mentored As a Post-Doctoral Research Fellow)

2019-20

Ella Small, Mechanical Engineering, The University of Texas at Austin

- Project: The Influence of Cognitive Load on Dynamic Balance During Steady State Walking
- 2018-20 Lindsey Lewallen, Mechanical Engineering, The University of Texas at Austin
Title: Assessment of Turning Performance and Muscle Coordination in Individuals Post-Stroke
- 2017-19 Ty Templin, Mechanical Engineering, The University of Texas at Austin
Title: The Influence of Load Carriage and foot stiffness on knee joint loading and metabolic cost during amputee walking: A preliminary modeling study
- 2017-18 Lydia Brough, Mechanical Engineering, The University of Texas at Austin
Title: Merged Plantarflexor Muscle Activity is Predictive of Poor Walking Performance in Post-Stroke Hemiparetic Subjects
- 2017-18 Shelby Walford, Mechanical Engineering, The University of Texas at Austin
Title: The Relationship between Propulsion Patterns and the Development of Upper-Extremity Pain in Manual Wheelchair Users
- 2017-18 Hannah Frame, Mechanical Engineering, The University of Texas at Austin
Title: The Influence of Lateral Stabilization on Hemiparetic Walking

Undergraduate

Former

- 2018 Brendan Lyden, Mechanical Engineering, The University of Texas at Austin
Project: Detailed review of skipping and running biomechanics
- 2014-15 Alaine Wetli, Materials Science Engineering, The Ohio State University
Thesis Title: The Effects of Quadriceps Weakness in Older Adults on Lower Extremity Muscle Function during Gait
- 2016-17 Jacqueline Roussos, Health Sciences, The Ohio State University
- 2016-17 Liz Leszcz, Mechanical Engineering, The Ohio State University

GRANT WRITING

Grants Submitted, Scored/Not Funded

- 2018 National Institutes of Health/NINDS R21. *Biomechanical Mechanisms and Modular Control Underlying Dynamic Balance Recovery Post-Stroke.*
Principal Investigator: Richard R. Neptune
Key Personnel: Sarah Roelker (Role: participated in all aspects of the proposal development and took a significant role in drafting the proposal)
- 2014 National Institutes of Health/NIAMS R01. *Using Subject-Specific Simulations to Predict the Outcomes of Rehabilitation for Knee Osteoarthritis.*
Principal Investigators: Dr. Robert Siston, Dr. Laura Schmitt
Key Personnel: Sarah Roelker (Role: drafted sections of the proposal)

HONORS, AWARDS & SCHOLARSHIPS

- 2019 GCMAS Best Poster Award
- 2017 Hayes Graduate Research Forum - Engineering Oral Presentation - 3rd Place
- 2014 National Science Foundation Graduate Research Fellow (awarded in 2012)
- 2013 Howard Hughes Medical Institute Med-into-Grad Scholar
- 2012 Ohio State University Graduate Fellowship
- 2012 Graduated Cum Laude; Honors Research Distinction in Mechanical Engineering

2008 Ohio State University Medalist Scholarship
 2008 Ohio Board of Regents' Ohio Academic Scholarship

INSTITUTIONAL SERVICE (University of Massachusetts Amherst)

Committees

2020-2021 Graduate Award Committee. Dept. of Kinesiology.
 2020-2021 Equity Committee. Dept. of Kinesiology.

PROFESSIONAL SERVICE

Professional Conference Service

2019 *Session Co-Chair, International Society of Biomechanics 2019 Meeting*
 Elderly Walking I (Podium), August 1, 2019

Ad-Hoc Manuscript Reviewer

Journal of Neurophysiology	Transactions on Neural Systems & Rehabilitation
Frontiers in Neurorobotics	Engineering
Journal of Biomechanics	PLOS ONE
Journal of Applied Biomechanics	Experimental Brain Research
Gait & Posture	Scientific Reports

BIOMCH-L Literature Update Moderator

2017 – 2019 BIOMCH-L is an international biomechanics scientific and professional community archive sponsored by the International Society of Biomechanics. I manage the online BIOMCH-L Literature Update forum (<https://biomch-l.isbweb.org/forums/7-Literature-Update>) which provides weekly updates of recently published literature in the fields of biomechanics and human locomotion.

OUTREACH

STEM Outreach to High School Students

2019 *Explore UT, University of Texas at Austin, TX*
 I helped organize a biomechanics event titled “Exploring Human Movement with Biomechanics: Where Science Meets FUN!” on Explore UT Day. I coordinated the event logistics and advertisement for this event which showcased the ongoing biomechanics research happening across the University of Texas campus and provided hands-on activities and demonstrations for students of all ages, parents, and teachers to learn about the field of biomechanics and human movement.

2018 *National Biomechanics Day, University of Texas at Austin, TX*
 I organized the first full scale National Biomechanics Day event at the University of Texas (UT) at Austin. I collaborated with students, staff, and faculty in the Department of Mechanical Engineering and the Department of Kinesiology and Health Education to coordinate two events that introduced local high school students and teachers to the field of biomechanics. At each event, we facilitated 6 activities in the areas of human body modeling, robotics, measuring human movement, and applications in medicine and sport.

2016 *National Biomechanics Day, Ohio State University, Columbus, OH*
 I facilitated a Tinker Toys® activity with a group of Columbus area high school students as part of a national initiative to introduce K-12 student to the field of biomechanics. To teach the students about the relationship between potential and kinetic energy during gait, the students were challenged to design passive dynamic walkers using Tinker Toys®. The students tested their design’s stability walking down a ramp with gravity as the only force applied to the walker.

- 2016 ***Saint Ursula Academy, Cincinnati, OH***
I addressed AP Biology, Robotics, and Engineering students at my former high school about pursuing careers in Mechanical and Biomedical engineering. I also facilitated the Tinker Toys® activity with the students.
- 2013-15 **Mechanical and Aerospace Engineering Graduate Student Association (MEGA)**
The mission of MEGA is to advise, assist, support, and socially involve graduate students in the Department of Mechanical and Aerospace Engineering at The Ohio State University. MEGA officers serve as resources for information, provide a voice for the graduate population, act as liaisons between graduate students and the faculty and administration, and foster community through social activities. I served as the Public relations Officer (2013-2014) and Vice President (2014-2015)
- 2010, 2012 ***Women in Engineering RISE Summer Camp, Ohio State University, Columbus, OH***
RISE summer camps introduce high school girls to engineering career paths through a comprehensive introduction and hands-on experiences in the many engineering majors offered at OSU. I assisted with the Biomedical/Mechanical Engineering presentations and activities for these events.

Ohio State University Panel Events

I was invited to serve on several panels to provide students an opportunity to inquire about research and fellowship opportunities. I addressed questions regarding how to get involved in research at Ohio State and how to prepare fellowship applications.

- 2012, 2016 NSF GRFP Fellowship Panels
2013 Women in Engineering Explore Engineering Research Panel

SOCIETY MEMBERSHIP

- 2011 – American Society of Biomechanics
2013-14, 2018-19 Gait and Clinical Movement Analysis Society
2013-14 American College of Sports Medicine
2019 – International Society of Biomechanics