

MELANIE B. LOTT, Ph.D.

Denison University, Department of Physics & Astronomy
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EDUCATION

Ph.D., Physics, Bryn Mawr College, Bryn Mawr, PA, May 2012

Dissertation: “The Mechanics of Regaining Balance in Pirouettes”

Advisors: Kenneth L. Laws, Dickinson College; Michael B. Schulz, Bryn Mawr College

M.S., Kinesiology (Biomechanics Concentration), University of Michigan, Ann Arbor, MI,

December 2006

Thesis: “Effect of Emotion on the Kinematics of Gait”

Advisor: M. Melissa Gross

B.S., Physics, *summa cum laude*, Denison University, Granville, OH, May 2004

Honors Thesis: “Physics and the Human Body”

Advisor: Kimberly M. Coplin

FELLOWSHIPS, GRANTS, AND AWARDS

Denison University Research Foundation Grant, 2021 (\$10,330)

R.C. Good Faculty Fellowship, 2020-2021

Varsity D Association Hall of Fame, Denison University, Track and Field, 2019

Pedagogical Practice Project Grant, “Blended Learning in the Introductory Physics Laboratory,”
Denison University, 2017

Doris Sill Carland Graduate Fellowship, awarded for excellence in teaching, Bryn Mawr
College, 2011-2012

Vernier Scientific Grant for Research on Balance in Pirouettes, 2010-2012 (\$5,000)

Vernier Scientific Grant for Physics of Dance Research, 2004-2005 (\$3,000)

President’s Medalist, Denison University, 2004

Benjamin Leslie Experimentalist Fellow, Denison University, 2004

Phi Beta Kappa Honor Society, 2004-present

NCAA Academic All-American, Track and Field, 2004

Sigma Pi Sigma Physics Honor Society, 2002-present

National Science Foundation REU Summer Fellowship, 2002

Denison University Heritage Scholarship, 2000-2004

TEACHING AND RESEARCH EXPERIENCE

Associate Professor of Physics & Astronomy

2020-present

Assistant Professor of Physics & Astronomy

2013-2020

Denison University, Granville, OH

Courses Taught: General Physics I + Lab (PHYS 121), General Physics II Lab

(PHYS 122), Principles of Physics II + Lab (PHYS 126), Principles of

Physics III + Lab (PHYS 127), Classical Mechanics (PHYS 305), Electricity

and Magnetism (PHYS 306), Experimental Physics + Labs (PHYS 312),

Physics Seminar (PHYS 400), Directed/Independent Studies, Senior Research.

Research in biomechanics of human movement, balance during rotations in dance

Mentoring undergraduate student research projects

Undergraduate student academic advising

Graduate Teaching Assistant 2008-2011

Bryn Mawr College Department of Physics, Bryn Mawr, PA

Lab Courses Taught: Introductory Physics I and II (PHYS 101/102 and PHYS 121/122), Electronics (PHYS 201), Intro to Quantum Mechanics (PHYS 214)

Grader: Advanced Electromagnetism (PHYS 309)

Orientation Leader for incoming graduate student teaching assistants

Guest lecturer for Introductory Physics I

Physics Teacher 2006-2008

Trinity Preparatory School, Winter Park, FL

Courses Taught: Honors Physics, AP Physics B, AP Physics C

Physics Laboratory Coordinator

Faculty advisor for 11 students

Head Coach JV Cross-Country, Assistant Coach Varsity Track & Field and Junior High Track & Field

Graduate Student Instructor 2005-2006

University of Michigan Division of Kinesiology, Ann Arbor, MI

Lab Courses Taught: Biomechanics of Human Movement (MOVESCI 330),

Motion Capture and Animation for Biomechanics (KINES 437)

Research Associate 2004-2005

Dickinson College Department of Physics & Astronomy, Carlisle, PA

Combined musculoskeletal modeling of the lower extremities with experimental, kinematic data of jump landings to determine patellar tendon forces during vertical jump landings

Co-advised undergraduate senior research project on the physics of horse jumping

PEER REVIEWED JOURNAL ARTICLES (Undergraduate student co-authors indicated by *)

1. M.B. Lott and *G. Xu, "Joint angle coordination strategies during whole body rotations on a single lower-limb support: An investigation through ballet pirouettes." *J. Appl. Biomech.* **36**, 103-112 (2020), doi: [10.1123/jab.2019-0209](https://doi.org/10.1123/jab.2019-0209).
2. M.B. Lott, "Translating the base of support: A mechanism for balance maintenance during rotations in dance," *J. Dance Med. Sci.* **23**, 17-25 (2019), doi: [10.12678/1089-313X.23.1.17](https://doi.org/10.12678/1089-313X.23.1.17).
3. M. Lott and K. Laws, "The physics of toppling and regaining balance during pirouettes," *J. Dance Med. Sci.* **16**, 167-174 (2012).
4. M. Cluss, K. Laws, *N. Martin, *T.S. Nowicki, and A. Mira, "The indirect measurement of biomechanical forces in the moving human body," *Am. J. Phys.* **74**, 102-108 (2006), doi: [10.1119/1.2149868](https://doi.org/10.1119/1.2149868).

OTHER JOURNAL ARTICLES

1. K. Laws and M. Lott, "Resource letter PoD-1: Physics of dance." *Am. J. Phys.* **81**, 7-13 (2013), doi: [10.1119/1.4766448](https://doi.org/10.1119/1.4766448). (invited)

JOURNAL ARTICLES IN PROGRESS

1. E. Winters, S. Doty, M. Lott, J. Baker, “Neuromechanical Integration of Pelvic-Thoracic Rotation Among Youth Baseball Throwers” [submitted]

TEXTBOOKS

1. Lott, Melanie B. *Biomechanics of Dance*. De Gruyter [under contract, in preparation]

PEER REVIEWED CONFERENCE PROCEEDINGS AND ABSTRACTS

1. M. Lott, “Rotational Inertia and Principal Axes of Rotation during Dance Pirouettes,” American Society of Biomechanics Annual Meeting, Virtual, August 2021. (Abstract)
2. M. Lott, “Joint Angle Coordination Strategies during Rotations in Dance,” American Society of Biomechanics Annual Meeting, Rochester, MN, August 2018. (Abstract) <http://www.asbweb.org/conferences/2018/abstracts/asb2018Abstracts.pdf>
3. M. Lott, “Dynamic Balance and Supporting Foot Displacements During Ballet Pirouettes,” American Society of Biomechanics Annual Meeting, Raleigh, NC, August, 2016. (Abstract) http://www.asbweb.org/conferences/2016/abstracts/AllAbstracts_2016.pdf
4. M.B. Lott, “A Peer Review Writing Workshop in the Advanced Lab,” 2015 BFY Proceedings [College Park, MD, July 22-24, 2015], edited by M. Eblen-Zayas, E. Behringer, and J. Kozminski, doi:[10.1119/bfy.2015.pr.013](https://doi.org/10.1119/bfy.2015.pr.013).
5. M. Lott, “Regaining Balance during Rotations in Dance,” World Congress of Biomechanics, Boston, MA, July 2014. (Abstract) <http://www.asbweb.org/wp-content/uploads/2014/SpecialTopics.pdf> (p. 1799)
6. M. Lott and K. Laws, “Balance During Rotations in Dance,” American Society of Biomechanics Annual Meeting, Long Beach, CA, August, 2011. (Abstract) <http://www.asbweb.org/conferences/2011/pdf/251.pdf>
7. Cluss, M.B., Crane, E.A., Gross, M.M. and Fredrickson, B.L. “Effect of Emotion on the Kinematics of Gait,” American Society of Biomechanics Annual Meeting, Blacksburg, VA, September, 2006. (Abstract) <http://www.asbweb.org/conferences/2006/pdfs/300.pdf>

INVITED TALKS/ COLLOQUIA

1. “Biomechanics of Dance: Pirouettes and Spinning Tops,” M. Lott. John Carroll University Physics Department Colloquium (Virtual Format), March 2021.
2. “‘Simple’ Physical Models of Complex Human Movement,” M. Lott. University of Illinois “Graduate Student Choice” Colloquium, Urbana-Champaign, IL, October 2018.
3. “Pirouettes and Principal Components Analysis,” M. Lott. Denison University Women in Science Research Talk, Granville, OH, November 2017.
4. “Uncovering Joint Angle Coordination Strategies for Rotating Balance with Principal Components Analysis,” M. Lott. Kenyon College Physics Colloquium, Gambier, OH, September 2017.
5. “Dynamic Balance: How Does the Human Body Sense and Correct for Displacements from Equilibrium While Rotating?” M. Lott. Wittenberg University, Springfield, OH, February 2016.
6. “Balancing Act – The Science and Art of Dance,” M. Lott. National Academy of Sciences Distinctive Voices Series, Irvine, CA, October 2015. (*Public presentation for 200 audience members*)

7. "Dancers and Spinning Tops: Understanding Balance during Rotations," M. Lott. Ohio Northern University, Ada, OH, March 2015.
8. "Dancers and Spinning Tops: Understanding Balance during Rotations," M. Lott. Denison University (DSA Seminar), Granville, OH, March 2014.
9. "The Physics of Dance," M. Lott. Colgate University, Hamilton, NY, November 2011.
10. "The Physics of Balance during Rotations in Dance," M. Lott. Dickinson College, Carlisle, PA, February 2011.
11. "Is this a Dance Studio or a Physics Laboratory?" K. Laws and M. Lott. Synergy and the Arts Conference, Washington County Public Schools, Hagerstown, MD, May 2011.
12. "Physics and Dance: A New *Pas de Deux*?" K. Laws and M. Lott. Randolph College Science Festival Keynote Address, Lynchburg, VA, March 2011.
13. "Dance as a Venue for Science?" K. Laws and M. Lott. Conference on Communicating Science through the Arts, City University of New York, New York, NY, October 2010.
14. "The Rules of the Game: Newtonian Mechanics Applied to Dance," K. Laws and M. Lott. Association of Dance Medicine and Research, Conference on Health and Pedagogy in Dance, Monte Carlo, Monaco, April 2010.

PROFESSIONAL CONFERENCE PRESENTATIONS (Student presenters indicated by *)

1. "(A)Symmetry in retire position during pirouettes," M. Lott. International Association of Dance Medicine and Science Annual Meeting, Virtual, October 2021. (Podium Presentation)
2. "Rotational inertia and principal axes of rotation during dance pirouettes," M. Lott. American Society of Biomechanics Annual Meeting, Virtual, August 2021. (Podium Presentation)
3. "Uncovering joint angle coordination strategies in pirouettes," M. Lott. International Association of Dance Medicine and Science Annual Meeting, Helsinki, Finland, October 2018. (Podium Presentation)
4. "Joint angle coordination strategies during rotations in dance," M. Lott. American Society of Biomechanics Annual Meeting, Rochester, MN, August 2018. (Poster)
5. "Blended learning in the introductory physics laboratory," M. Lott. Blended Learning in the Liberal Arts Conference, Bryn Mawr, PA, May 2018. (Podium Presentation)
6. "A Study of Overhand Throwing Using Simultaneous High-Speed Kinematic Videography and Surface Electromyography: I. First Results on Core Neuromuscular Integration," S. D. Doty, E. R. Winters, M. Lott, S. L. Doty, *S. Munoz, *N. Staniszewski, & *S. Zhao, 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Honolulu, 2018. (Poster)
7. "Dynamic balance and supporting foot displacements during ballet pirouettes," M. Lott. American Society of Biomechanics Annual Meeting, Raleigh, NC, August 2016. (Poster)
8. "A peer review workshop in the advanced lab," M. Lott. AAPT Conference on Laboratory Instruction Beyond the First Year of College (BFYII), College Park, MD, July 2015. (Poster)
9. "Maintaining balance in pirouettes: Ankle adjustments," *G. Aldana, *A. Oyler, and M. Lott. Ohio Physiological Society Annual Meeting, Oxford OH, October 2014. (Poster) (**Best Student Research Presentation Award**)
10. "Understanding the control of movement from frogs to feet," J. Monroy and M. Lott, Ohio Physiological Society Annual Meeting, Oxford, OH, October 2014. (Podium Presentation)
11. "Regaining balance during rotations in dance," M. Lott. World Congress of Biomechanics, Boston, MA, July 2014. (Poster)
12. "Balance during rotations in dance," M. Lott. American Society of Biomechanics Annual Meeting, Long Beach, CA, August 2011. (Podium Presentation)

13. “Balance during rotations in dance: A physical analysis,” M. Lott. Sigma Xi Northeast Research Symposium, Stony Brook, NY, April 2011. (Poster) (*Third Place Graduate Student Poster*)

WORKSHOP PRESENTATIONS

1. “Tips for Faculty New to Teaching in the Advanced Lab,” M. Lott. Advanced Laboratories Physics Association (ALPhA) Third Conference on Laboratory Instruction Beyond the First Year (BFY3), Loyola University, Maryland, July 2018.
2. “Optical Tweezers in the Advanced Lab,” M. Lott. *Intermediate and Advanced Laboratories Workshop* (Workshop W38), AAPT Summer Meeting, Cincinnati, OH, July 2017.
3. “Dynamic Body Workshop,” M. Lott, L. Naugle, and K. Sharp. University of California-Irvine, Irvine, CA, October 2015.
4. “Physics Applied to Choreography,” L. Naugle and M. Lott. University of California-Irvine, Irvine, CA, October 2015.
5. “Physics-Based Ballet Class,” K. Laws and M. Lott. Randolph College Science Festival, Lynchburg, VA, March 2011.
6. “Application of Theory to Practice: Newtonian Mechanics Applied to Dance,” K. Laws and M. Lott. Association of Dance Medicine and Research, Conference on Health and Pedagogy in Dance, Monte-Carlo, Monaco, April 2010.
7. “Using VideoPoint to Study the Physics of Human Movement,” M. (Cluss) Lott and K. Laws, Dickinson College, Carlisle, PA, July 2005.

DENISON UNIVERSITY STUDENT RESEARCH PROJECTS

1. Andrew Zabinski (Physics, Class of 2023)
 - a. 2021 Anderson Summer Research, “Biomechanics of Dance Book Project: Energy and Momentum in Dance”
2. Wenpu Xia (Physics, Class of 2022)
 - a. 2021 Spring Directed Study Project, “Musculoskeletal Modeling of Dynamic Dance Movements”
3. Jake Coplin (Individually Designed Major: Integrated Science and Design, Class of 2020)
 - a. 2019-2020 Senior Research Project (Academic Year), “User Informed Design, Testing, and Production of a 3D Printed Lower-Limb Bicycle Prosthesis”
4. Alswell Tulasi (Physics, Class of 2020)
 - a. 2020 Spring Directed Study Project, “Breakdancing Biomechanics”
5. Hoang Anh Nguyen (Physics, Class of 2022)
 - a. 2019 Anderson Summer Research (9 weeks), “The Neuromechanics of a Baseball Pitch: Role and Timing of Latissimus Dorsi and Erector Spinae”
 - b. 2021 Summer Research (DURF, 10 weeks), “Biomechanics of Dance Book Project”
6. Adrian Miller (Physics, Class of 2019)
 - a. 2019 Spring Directed Study Project, “Biomechanics of a Soccer Shot”
7. Christopher Broyles (Physics, Class of 2020)
 - a. 2018 Anderson Summer Research (10 weeks), “The Neuromechanics of a Baseball Pitch: Horizontal Shoulder Abduction Timing and Magnitude”
8. Jane Bright, (Physics and Mathematics, Class of 2018)
 - a. 2017-2018 Year-Long Directed Study Project, “Ninja Physics,” Built IMU + Arduino interfaces and 3D printed boxes to hold, won a Denison University Lisska Center Grant (~\$500) to fund the project

9. Gan Xu, (Physics, 3-2 Engineering, Class of 2018)
 - a. 2017 Anderson Summer Research (10 weeks), “Balance Adjustments during Pirouettes: A Principal Components Analysis”
 - b. 2017 Fall Directed Study Project
10. Nicholas Staniszewski, (Physics and Cinema, Class of 2019) – Anderson Scholarship for Excellence in Science (“Big Anderson”) Award Winner
 - a. 2018 Anderson Summer Research (10 weeks), “The Neuromechanics of a Baseball Pitch: The X-Angle as it relates to the Muscle Activation of the Non-Dominant Abdominal Oblique”
 - b. 2017 Anderson Summer Research (10 weeks), “Effect of Core Muscle Activation on the Kinematics of a Baseball Pitch”
 - c. 2017 Spring Directed Study, “Biomechanics and Muscle Activation of the Core during Baseball Pitching – Data Collection”
11. Ryan Liedke, (Physics, Class of 2016)
 - a. 2016 Spring Directed Study Project, “Zeeman Effect Measuring the Bohr Magneton via Spectroscopic Analysis”
12. Benedict Khoo, (Biology, Class of 2016)
 - a. 2015-2016, Senior Research Project (Academic Year), “Biomechanics and Muscle Physiology of Throwing”
13. Trevor Masters, (Computer Science, Class of 2016)
 - a. 2015 Anderson Summer Research (10 weeks), “Capturing the Kick: Developing Biomechanical Analyses of Taekwondo America Kicks”
 - b. 2016 Senior Research Project (Semester), “Analyzing the Mechanisms Involved in Maintaining Balance during Taekwondo America Kicks” – invited to present his research at the Sigma Xi Induction Ceremony and Banquet
14. Gemma Aldana, (Biochemistry, Class of 2017)
 - a. 2014 Summer Anderson, “Physics of Toppling and Regaining Balance in a Pirouette”
 - b. Fall 2014 Directed Study Project
15. Ann Oyler, (Physics, Class of 2015)
 - a. 2014 Summer Anderson, “Regaining Balance in a Pirouette: Adjustment Strategies”
 - b. Fall 2014 Directed Study Project

EXTERNAL SERVICE (Selected)

Journal Referee, <i>Journal of Dance Medicine and Science, Medical Problems of Performing Artists, Medicine & Science in Sports & Exercise, Sports Medicine – Open, The Physics Teacher, American Journal of Physics</i>	
Girls STEAM Ahead Series, The Works, Newark, Ohio	2021
Abstract Review Committee, American Society of Biomechanics, Annual Meeting	2021
Co-Chair, Breakouts and Networking Subcommittee, Organizing Committee for ALPhA’s Conference on Laboratory Instruction Beyond the First Year	2017-2018
Granville Elementary Science Sunday, with the Society of Physics Students	2017, 2018
Kids Tech University, The Works, Newark, Ohio	2017
Kenyon College Girls’ Science Saturdays	2017
Reviewer, <i>BFY II Proceedings</i>	2015
Student Presentation Judge, Ohio Physiological Society Annual Meeting	2014

UNIVERSITY SERVICE (Selected)

Varsity D Association Board of Directors	2015-present
Outreach Coordinator, Department of Physics & Astronomy	2014-present
Society of Physics Students (SPS) Organization Advisor	2014-present
Committee on Intercollegiate Athletics	2018-2020
Tuesday Lunch Series Coordinator	2019-2020
Physics Department Comprehensive Exam Committee	2015-2019
Horizon Fund Board	2016-2019
New Faculty Orientation, "Teaching at Denison" Discussion Leader	2017, 2018
Denison Scientific Association (DSA) Co-Organizer	2015-2016
June Orientation Advisor	2015, 2018, 2019, 2020, 2021
Department Visiting Faculty Search Committee	2015, 2019
Senior Research Thesis Outside Reader, Rachel Halteman, Dance Major ('15)	2014-2015
Campus Affairs Council	2014-2015
Anderson Scholarship Selection Committee	2014, 2020

PROFESSIONAL MEMBERSHIPS

- American Society of Biomechanics (ASB)
- International Association of Dance Medicine & Science (IADMS)
- American Association of Physics Teachers (AAPT)
- Advanced Lab Physics Association (ALPhA)