

Alex Roth, Ph.D.

1846 S Main St Euler 236, Upland Indiana 46989 • (765) 998-4843 • alex_roth@taylor.edu

Education

Summer 2022 PhD in Mechanical Engineering

Department of Mechanical Engineering
Purdue University, West Lafayette, Indiana
Dissertation: "Wearable Adjunct Ozone and Antibiotic Therapy System for Treatment of Infected Dermal Wounds"
Advisor: Prof. Rahim Rahimi

Fall 2020 MSME in Mechanical Engineering

Department of Mechanical Engineering
Purdue University, West Lafayette, Indiana
Advisor: Prof. Rahim Rahimi

2017 Bachelor of Science in Engineering

Mechanical Concentration
Physics Minor
Messiah University, Mechanicsburg, Pennsylvania
Summa Cum Laude

Teaching Experience

Assistant Professor of Engineering

Department of Physics and Engineering, Taylor University, Fall 2022-Present

Responsible for teaching and mentoring undergraduate students through engineering courses including fluid mechanics and mechanical engineering laboratory exercises. Integrating faith-based learning into curriculum to help encourage and mentor students in both academic learning and spiritual development. Enabling unique learning opportunities through student involvement in guided research projects.

Graduate Teaching Assistant

Department of Mathematics, Purdue University, Fall 2018-2019

Responsible for preparing lectures, activities, and weekly quizzes for full course of 30+ undergraduate students covering topics in precalculus, trigonometry, and integral calculus. Held office hours and co-wrote exams with other section instructors. Led recitation discussions over current differential calculus material twice a week for 30+ undergraduate students in mathematics and similar fields. Wrote assessments covering major topics.

Undergraduate Student Tutor

Department of Mathematics, Physics and Statistics, Messiah College, Fall 2015

Held open office hours weekly to provide assistance for students on current material for general physics courses (PHYS 201, 202). Topics included kinematics, dynamics, electromagnetism, and optics.

Undergraduate Teaching Assistant

Department of Mathematics, Physics, and Statistics, Messiah University, Fall 2014-2016

Responsible for grading weekly quizzes for undergraduate course covering first and second order differential equations. Led recitation sections for 20+ undergraduate students to reinforce current material for introductory calculus course. Proctored and graded weekly quizzes.

Research and Work Experience

Graduate Research Assistant

Purdue University, 2019-2022

Primary research focused on development of alternative therapies for antibiotic-resistant dermal wounds. Additional work on electromechanical piezoelectric characterization, small-scale fluidics systems, and additive manufacturing techniques.

Undergraduate Engineering Researcher

The Collaboratory for Strategic Partnerships and Applied Research, 2015-2017

Research and development of inexpensive Dynamic Light Scattering system for HIV detection. Additional work on development of universal trailer hitch attachment for small displacement motorcycles.

Undergraduate Student Researcher

NASA Space Consortium, 2016

Development and characterization of particle detector designs implementing silicon photomultiplier technology for space-based applications.

Engineering Intern

Granite Industries, Summer 2015

Developed new prototype electric single rider cart for all terrain use and updated numerous CAD designs for increased manufacturability.

Publications

Roth, A., Krishnakumar, A., *et. al.* "Biocompatibility and Safety Assessment of Combined Topical Ozone and Antibiotics for Treatment of Infected Wounds," *ACS Biomaterials Science and Engineering*, 26 May 2023

Roth, A., Krishnakumar, A. Rahimi, R., "Ozone as a Topical Treatment for Infected Dermal Wounds," *Frontiers in Bioscience Elite*, 19 April 2023

Roth, A., Maruthamuthu, M.K. *et. al.* "Wearable Adjunct Ozone and Antibiotic Therapy System for Treatment of Gram-Negative Dermal Bacterial Infection," *Scientific Reports*, 17 Aug 2022

Sedaghat-Hoor, S. **Roth, A.**, *et. al.* "Laser-induced atmospheric CuXO formation on copper surface with enhanced electrochemical performance for non-enzymatic glucose sensing," *Journal of Materials Chemistry C*, 29 July 2021

Roth, A., Elkashif, A., *et. al.* "Wearable and Flexible Ozone Generating System for Treatment of Infected Dermal Wounds," *Frontiers in Bioengineering and Biotechnology*, May 2020.

Kryemadhi, A. **Roth, A.**, *et. al.* "Performance of LYSO and CeBr3 Crystals Readout by Silicon Photomultiplier arrays and compact detectors for space based applications." *Journal of Instrumentation*, 3 Feb 2017.

Patents

Roth, A., Ziaie, B. *et. al.* PRF 69057-01 "OZONE GENERATION APPARATUSES AND METHODS OF TREATING WOUNDS," 2020

Presentations

Oral Presentations

Roth, A. (2021 February). *Ozone Generation Apparatuses and Methods of Treating Wounds*. Purdue Office of Technology Commercialization Showcase, Purdue University, West Lafayette, IN.

Barner, L. **Roth, A.** (2017 April). *A Low-Cost Dynamic Light Scattering System for Detection of Viral Aggregates*. College of Science, Engineering, and Health 2017 Symposium, Messiah College, Mechanicsburg, PA

Barner, L., Grove, A., **Roth, A.**, *et. al.* (2017 April). *High Energy Compact Particle Detectors for Space*.

College of Science, Engineering, and Health 2017 Symposium, Messiah College, Mechanicsburg, PA

Barner, L., Grove, A., **Roth, A.**, et. al. (2017 January). *Development of Compact Particle Detectors for Space Based Instruments*. American Physical Society April Meeting, Washington D.C.

Barner, L., Grove, A., **Roth, A.**, et. al. (2016 April). *A Search for Dark Matter: Prototype Development of Compact Cosmic Ray Detectors*. College of Science, Engineering, and Health 2016 Symposium, Messiah College, Mechanicsburg, PA

Barner, L., Grove, A., **Roth, A.**, et. al. (2016 March). *Development of Prototype Detectors for Cosmic Ray and Dark Matter Searches in Space*. American Association of Physics Teachers Central Pennsylvania Section Annual Conference, Bethlehem, PA

Poster Presentations

Roth, A., Krishnakumar, A. "Antimicrobial Development to Counter Wound Infections in Military Personnel - Wearable Ozone Therapy System for Wound Infection Treatment and Prevention." Military Health System Research Symposium, Kissimmee, FL. 2022 September Poster Presentation

Barner, L., **Roth, A.** "A Low-Cost Dynamic Light Scattering System for Detection of Viral Aggregates." College of Science, Engineering, and Health 2017 Symposium, Messiah College, Mechanicsburg, PA. 2017 April Poster Presentation

Bright, J., **Roth, A.** "Cycle Advancements for Rugged Terrain – Universal Hitch." College of Science, Engineering, and Health 2017 Symposium, Messiah College, Mechanicsburg, PA. 2016 April Poster Presentation

Honors & Awards

President's Scholarship, 2013-2017

Sigma Pi Sigma National Physics Honor Society, 2015-2017

College Honors Program, 2013-2017

Messiah College Engineering Honor Society, 2016-2017

Community Engagement

Simeon Trust First Principles Teaching Cohort Participant

Kossuth St. Baptist Church, Spring 2021

Studied online curriculum in a small group lead by preaching pastor to develop passion and skill for preaching and teaching the Word of God. Included written assignments, reflection questions, and practice preparing and delivering sermons.

Perspectives on the World Christian Movement Class Participant

Fall 2020

Completed semester-long course on world missions hosted by local church. Coursework included weekly reading assignments, reflection questions, and group discussion about God's heart for the World and the role of all believers in accomplishing the task.