

Timothy O. Josephson

Mechanical & Biomedical Engineer

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Research Areas

Orthopaedic mechanobiology & biomechanics; bone tissue engineering; fracture mechanics; fracture repair; computational mechanics; computational geometry.

Education

2020–2025 **Ph.D., Biomedical Engineering, Boston University, Boston, MA**

2015–2020 **Master of Science in Mechanical Engineering, Drexel University, Philadelphia, PA**
Bachelor of Science in Mechanical Engineering, Drexel University, Philadelphia, PA
Summa Cum Laude

Experience

Sep 2025– **Post-Doctoral Research Fellow, University College Dublin, Dublin, Ireland**
Present *Developmental Biomechanics Lab*
Advisor: Dr. Niamh C. Nowlan
Study of embryonic skeletal development and mechanobiology.

Sep 2020– **Graduate Research Fellow, Boston University, Boston, MA**
Sep 2025 *Skeletal Mechanobiology and Biomechanics Lab*
Advisor: Dr. Elise F. Morgan
Study of additively manufactured hydroxyapatite scaffolds for bone tissue engineering; design optimization of scaffolds for bone tissue engineering; computational modeling of skeletal tissue growth and differentiation.

Jan 2018– **Researcher, Drexel University, Philadelphia, PA**
Jun 2020 *Multiscale Computational Mechanics and Biomechanics Lab*
Advisor: Dr. Ahmad R. Najafi
Finite element fracture modeling of cortical bone; histological processing and image analysis.

Apr 2019– **R&D Engineer Co-op, DePuy Synthes - Johnson & Johnson, West Chester, PA**
Sep 2019 *Trauma, Upper Extremities*
Design & computational mechanical analysis of "small fragment" bone fracture fixation plates; writing of design verification documentation and engineering rationales for project launches.

Apr 2018– **Researcher, Thomas Jefferson University, Philadelphia, PA**
Apr 2019 *Daniel Baugh Institute for Functional Genomics/Computational Biology*
Advisor: Dr. Rajanikanth Vadigepalli
Computational systems biology modeling of epidermal wound healing.

Apr 2017– **Biomechanics Co-op, Applied Physics Lab - Johns Hopkins University, Laurel, MD**
Sep 2017 *Biomechanics and Injury Mitigation Systems*
Injury biomechanics motion capture analysis; high rate mechanical testing & digital image correlation; data management system development for injury surrogate experimental data.

Publications

Papers

Josephson, T. O., & Morgan, E. F. (2024). Mechanobiological optimization of scaffolds for bone tissue engineering. *Biomechanics and Modeling in Mechanobiology* 2024,

1–18.

Josephson, T. O., & Morgan, E. F. (2023). Harnessing mechanical cues in the cellular microenvironment for bone regeneration. *Frontiers in Physiology*, 14, 1232698.

Maghami, E., Moore, J. P., **Josephson, T. O.**, & Najafi, A. R. (2022). Damage analysis of human cortical bone under compressive and tensile loadings. *Computer Methods in Biomechanics and Biomedical Engineering*, 25(3), 342–357.

Josephson, T. O., Moore, J. P., Maghami, E., Freeman, T. A., & Najafi, A. R. (2022). Computational study of the mechanical influence of lacunae and perilacunar zones in cortical bone microcracking. *Journal of the Mechanical Behavior of Biomedical Materials*, 126, 105029.

Maghami, E., **Josephson, T. O.**, Moore, J. P., Rezaee, T., Freeman, T. A., Karim, L., & Najafi, A. R. (2021). Fracture behavior of human cortical bone: Role of advanced glycation end-products and microstructural features. *Journal of Biomechanics*, 125, 110600.

Conference Presentations

Josephson, T. O., & Morgan, E. F., Predicting Skeletal Tissue Growth and Differentiation for Bone Tissue Engineering. 30th Congress of the European Society of Biomechanics, 2025, Zurich, CH (oral presentation).

Josephson, T. O., & Morgan, E. F., Modeling Formation and Differentiation of Skeletal Tissues. Annual Meeting of the American Society for Bone and Mineral Research, 2024, Toronto, ON, CA (poster presentation).

Josephson, T. O., & Morgan, E. F., Tailoring the Mechanical Microenvironment to Enhance Osteogenesis in Bone Tissue Engineering Scaffolds. Annual Meeting of the American Society for Bone and Mineral Research, 2023, Vancouver, BC, CA (poster presentation).

Josephson, T. O., & Morgan, E. F., Multiscale Mechanobiologically Optimized Scaffold Designs for Bone Tissue Engineering. Summer Biomechanics, Bioengineering, and Biotransport Conference, 2023, Vail, CO, US. (oral presentation).

Thesis

Josephson, T. O. (2020). A Microstructural Analysis of the Mechanical Behavior of Cortical Bone Through Histology and Image Processing. Drexel University.

Software

MyMesh: General purpose, implicit, and image-based meshing in python
Available on GitHub and PyPI

Skills

Programming Languages: Python; Matlab; Julia.

Software: Abaqus; Ansys; Linux; git; ImageJ/FIJI; Adobe Illustrator.

Laboratory: micro-computed tomography; confocal microscopy; paraffin sectioning & histology; mammalian cell culture.

Teaching & Mentorship

2024– Present	Undergraduate Mentoring, Abeeha Bhatti (Biomedical Engineering, BU, Class of 2026) Graduate Mentoring, Amaya Lewis (M.S., Medical Sciences, BU) Undergraduate Mentoring, Ariella Blake (Biomedical Engineering, BU, Class of 2025)
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2022	Teaching Assistant, Fluid Mechanics (ME303), Boston University
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2021	Teaching Assistant, Engineering Mechanics 1 (EK301), Boston University
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Outreach Activities

2024, Judge, High School Science Fair, Pioneer Charter School of Science, Everett, MA
2025
2023 Speaker, Pioneer Charter School of Science, Everett, MA

2019 Speaker, Masterman High School Enrichment Program, Philadelphia, PA
Honors & Awards

2025 ON Orthoregeneration Award at the 30th Congress of the European Society of Biomechanics, 2025

2016 Membership, *Pi Tau Sigma* - International Honor Society for Mechanical Engineers

2015–2020 Dean's List, Drexel University