

TYLER R. FARA

github.com/oneteaches2learn/solvers

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EDUCATION

Ph.D. Mathematics , Oregon State University, GPA: 4.0 (Advisor: Dr. M. Peszynska) Anticipated graduation: Spring 2026.	2020–Present
M.S. Mathematics , Oregon State University, GPA: 4.0 (Advisor: Dr. M. Peszynska) Capstone project: <i>“Investigating the Bioheat Transfer (Pennes) Equation”</i> .	2020–2022
M.S. Biomedical Science , Colorado State University, GPA: 4.0	2009–2010
B.S. Chemistry , Indiana University Minor: Mathematics.	2003–2007

SCIENTIFIC COMPUTING SKILLS

- **MATLAB**: Developed `backslashPDE`, my own object-oriented FEM suite with tools for meshing, solving, and post-processing problems on 2D perforated domains; supports nonlinear, constrained, and coupled PDE/ODE systems with nonlinear boundary conditions.
- **C++**: Contributed to `Pele` and `AMReX` (production-level HPC frameworks for supercomputing CFD simulations) during two internships at NREL; additional experience with parallel computing libraries `MPI`, `OpenMP`, and `CUDA`, with linear algebra libraries `BLAS` / `LAPACK`, and with FEM libraries `MFEM` and `deal.ii` from research and coursework.
- **Python**: Used for post-processing and visualization of results at NREL. Some experience with `pandas`, `NumPy`, `SciPy`, `matplotlib`, and `scikit-learn` through coursework in machine learning. Some experience with `ngsolve` for FEM simulations.
- **C** and **Fortran**: Used in coursework on data structures, memory management, algorithm design, and parallel programming.
- **git** and **GitHub**: Used regularly in my personal and collaborative coding projects, including workflow management and remote repository integration.
- **Linux** / **UNIX**: Extensive experience in remote and high-performance computing environments, including supercomputer access, batch job management, and automation of research workflows.

RESEARCH SUPPORT

NREL Research Collaboration (Funded Extension of MSGI Project) , National Renewable Energy Lab (NREL), PI: Michael Martin	July–October 2025
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- Continuing and expanding MSGI 2023 research on propagation of error in viscosity and thermal conductivity calculations due to EoS choice in combustion simulations.
- Supported through NREL funding to prepare results for publication and further model validation.

Graduate Research Stipend	May–June 2025
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- Funded by the Joel Davis Faculty Scholar Award, awarded to Prof. Malgorzata Peszynska, Dept. of Mathematics, Oregon State University.

Graduate Research Assistant , NSF DMS-1912938 (PI: M. Peszynska)	Spring 2024
Graduate Research Assistant , NSF DMS-1912938 (PI: M. Peszynska)	Winter 2024
Graduate Research Assistant , NSF DMS-1912938 (PI: M. Peszynska)	Summer 2022

- Research on efficient implementation and convergence of mixed finite element schemes with focus on overlapping continua and immersed boundary approach.

NSF Mathematical Sciences Graduate Internship (MSGI),
National Renewable Energy Lab (NREL), (PI: Michael Martin)

Summer 2023

- Research on propagation of error in viscosity and thermal conductivity calculations due to equation of state (EoS) choice in exascale-level supercomputer combustion simulation.
- Discovered an error in the science underlying the mixing theory used to compute viscosity for fluid mixtures and proposed a correction, which the team at NREL implemented.

PROFESSIONAL EXPERIENCE

Instructor of Record, Oregon State University

Winter 2023 & Winter 2025

- Instructor of record for math department's Ph.D. qualifying exam preparation seminar.

Graduate Teaching Assistant, Oregon State University

2020–Present

- GTA: Differential equations, differential and integral calculus, vector calculus, analysis, linear algebra.
- Grader: Analysis, numerical partial differential equations.

SIAM Student Chapter Vice President, Oregon State University

Fall 2024–Fall 2025

SIAM Student Chapter President, Oregon State University

Fall 2023–Fall 2024

Search Committee for Differential Geometry Position, Oregon State University

Fall 2023–Spring 2024

- Student representative for search committee.
- Research on efficient implementation and convergence of mixed finite element schemes with focus on overlapping continua and immersed boundary approach.

OSU Calculus Course Remodel, Paid Consultant, Oregon State University

Summer 2021

- Wrote lesson plans and in-class content for Oregon State's project to standardize the calculus sequence.

Research Experience for Undergraduates (REU), University of Colorado – Boulder

Summer 2019

- Adviser: Dr. Markus Pflaum. Project: *“Topological Data Analysis in Cosmology”*.

Manager of Content and Instructional Design, Kaplan Test Prep

2015–2020

- Led award-winning projects and teams of up to 50 collaborators creating content in undergraduate physics, chemistry, biology, psychology, and mathematics. Designed, wrote, and edited lessons, books, videos, marketing material, and practice resources. Gained a lot of experience with collaborative work.

MCAT Instructor, Kaplan Test Prep

2010–2024

- Taught undergraduate science and test preparation strategies, online and in person, to premed students. Demonstrated excellent communication and presentation skills, specializing in science and mathematics content.

Professional Research Assistant (PI: Dr. Paul Megee), University of Colorado, Anschutz

2010–2011

- Researched and implemented molecular genetics techniques to create antibody tags to proteins of interest.

RESEARCH INTERESTS

- Analysis and approximation of partial differential equations modeling coupled phenomena with discontinuous data. Hybrid continuum/discrete models. Mixed finite element methods.
- Multiscale modeling of coupled thermal and hydrodynamic phenomena in the human body, including heat transfer through blood flow and medical applications thereof, e.g. hypothermia and hyperthermia treatments.
- High-performance computing, including techniques involving parallel algorithm design and distributed/GPU computing.

PUBLICATIONS

Manuscript in Revision:, “Nonlinear bioheat model for dynamics of hypothermia and frostbite.”

- Manuscript in revision for *Mathematical Biosciences and Engineering*

- M. Peszynska, T. Fara, “Nonlinear bioheat model for dynamics of hypothermia and frostbite.” This paper describes a coupled PDE/ODE system modeling, respectively, temperature in the hands/feet and the body core during exposure to extreme cold. Coupling through nonlinear energy exchange terms is used to model the body’s protective mechanisms against hypothermia. This paper presents describes the model and presents simulation results.

Manuscript in Preparation:, “Stability analysis and finite element discretization of ... hypothermia and frostbite.”

- M. Peszynska, T. Fara, “Stability analysis and a priori estimates for a finite element discretization of a nonlinear model for the dynamics of hypothermia and frostbite.” This paper presents stability analysis and a priori estimates for a generalization of the model presented in our prior paper, “Nonlinear bioheat model for dynamics of hypothermia and frostbite.”

Manuscript in preparation:, “Quantifying the importance of equation of state...”

- T. Fara, S. Yellapantula, M. Martin, “Quantifying the importance of equation of state and transport property compatibility in supercritical fluids” This paper describes the effect of equation of state choice (ideal gas law, Soave–Kwong, or Span–Wagner) and viscosity model (Laesecke–Muzny or Lemmon–Jacobsen) on simulations of supercritical CO₂ and other chemical species involved in combustion.

Co-author, “Frozen fingers, warm heart: a predictive model for survival heat management.” May 2025

- T. Fara, M. Peszynska. “Frozen fingers, warm heart: a predictive model for survival heat management”; SIAM News online. SIAM News blog. Manuscript submitted for publication.

Co-author, “Mixed dimensional modeling with overlapping continua on Cartesian grids...” September 2023

- M. Peszynska, T. Fara, M. Phelps, N. Zhang, “Mixed dimensional modeling with overlapping continua on Cartesian grids for complex applications”; Finite Volumes for Complex Applications X—Volume 1, Elliptic and Parabolic Problems, Springer, 2023, p129-145, https://doi.org/10.1007/978-3-031-40864-9_8.

Co-author, “Cell cycle-specific cleavage of Scc2 regulates its cohesin deposition activity.” May 2014

- J. Woodman, T. Fara, M. Dzieciatkowska, M. Trejo, N. Luong, K. C. Hansen, P. C. Megee. “Cell cycle-specific cleavage of Scc2 regulates its cohesin deposition activity.” Proceedings of the National Academy of Sciences, 111(19), 7060-7065, 2014.

PRESENTATIONS

SIAM PNW, University of Washington October 2025

- *Analysis and Simulation of a Nonlinear Bioheat Model for Hypothermia and Frostbite.*

MFEM Community Workshop, Portland State University September 2025

- *A Stable FEM Framework for Coupled PDE–ODE Bioheat Models with Nonlinear Boundary Conditions.*

Applied Math Seminar, Oregon State University May 2025

- *Product-space a priori error analysis and numerical simulation of a coupled nonlinear bioheat PDE–ODE model.*

CASCADE RAIN Mathematics Meeting, Corvallis, OR April 2025

- *Hypothermia and frostbite: a model for energy exchange between the body core and extremities during cold exposure.*

SIAM Annual Conference, Contributed Talk, Spokane, WA July 2024

- *Modeling Hypothermia and Frostbite with Coupled Hydrological and Thermal Models.*

SIAM Life Sciences, Contributed Talk, Portland, OR June 2024

- *Modeling Hypothermia with a Multiscale Model Coupling Partial Differential Equations for Blood Flow and Temperature with Ordinary Differential Equations.*

Applied Math Seminar, Oregon State University April 2024

- *Modeling hypothermia, frostbite, and blood flow regulation with a coupled PDE and ODE system.*

ICERM: PDEs and Geometry, Poster Session, Brown University March 2024

• <i>Modeling hypothermia with a multiscale model coupling partial differential equations for temperature with ordinary differential equations.</i>	
ICERM: Multiphysics, Poster Session , Brown University	February 2024
• <i>Modeling hypothermia with a multiscale model coupling partial differential equations for temperature with ordinary differential equations.</i>	
Applied Mathematics Seminar , Oregon State University	October 2023
• <i>Comparing the Effect of Equation of State Choice on Supercritical CO₂ Simulation.</i>	
SIAM PNW, Contributed Talk , Western Washington University	October 2023
• <i>Modeling hypothermia with mixed dimensional approach coupled with an ordinary differential equation.</i>	
Presentation of Research Results , National Renewable Energy Lab (NREL)	September 2023
• <i>Examining the Cause of $\mu < 0$.</i>	
NSF MSGI Virtual Research Symposium , Virtual (host site: NREL)	August 2023
• <i>Comparing the Effect of Equation of State Choice on Supercritical CO₂ Simulation.</i>	
Masters Capstone Presentation , Oregon State University	December 2022
• <i>Investigating the Bioheat Transfer (Pennes) Equation.</i>	
Applied Mathematics Seminar , Oregon State University	May 2022
• Lightning talk about <i>Modeling Hypothermia and Hyperthermia.</i>	
SIAM PNW Poster Session and Poster Blitz , Washington State University, Vancouver	May 2022
• <i>Modeling Hypothermia and Hyperthermia.</i>	
REU Conference at University of Colorado , University of Colorado – Boulder	August 2019
• <i>Topological Data Analysis in Cosmology</i>, with M. Pflaum and others in REU group. (Presented by Fara, T.)	

CONFERENCES AND WORKSHOPS ATTENDED

SIAM PNW[†] , Seattle, WA	October 2025
MFEM Community Workshop[†] , Portland, OR	September 2025
SIAM Annual[†] , Spokane, WA	July 2024
SIAM Life Sciences , Portland, OR	June 2024
ICERM, PDEs and Geometry: Numerical Aspects[†] , Brown University,	March 2024
ICERM, Numerical Analysis of Multiphysics Problems[†] , Brown University,	February 2024
URSSI Research Software Engineering Winter School , Oregon State University in Portland	January 2024
SIAM PNW, Biennial Meeting[†] , Western Washington University	October 2023
SIAM PNW, Biennial Meeting[†] , Washington State – Vancouver	May 2022
Analysis of Fluid and Elastic Bodies , Universitat Regensburg (virtual)	April 2022
College of Science, Thought Leadership Forum , Oregon State University	March 2022
Weekly Applied Mathematics and Computation Seminar , Oregon State University	Fall 2021–Present

[†] : Travel award recipient.

AWARDS

Graduate Student Excellence Award , Oregon State University	Spring 2025
Excellence in Qualifying Exams Award , Oregon State University	Fall 2022
Outstanding Performance in Coursework Award , Oregon State University	Spring 2022
Kaplan Way Leadership Award: Excellence in Product Creation , Kaplan Test Prep	2017 and 2018

National Teacher of the Year , Kaplan Test Prep	2014 and 2015
Southwest Teacher of the Year , Kaplan Test Prep	2013

COURSEWORK

Graduate Mathematics (Oregon State University, GPA 4.0): Finite Element Methods, Finite Difference Methods, Discontinuous Galerkin Methods, Computational Multiphysics, Computational Fluid Dynamics, Approximation of Flow PDEs, Computational Harmonic Analysis, Numerical Linear Algebra, Numerical ODEs, Partial Differential Equations, Advanced PDEs, Real Analysis, Complex Analysis, Linear Algebra, Abstract Algebra, Topology, Differential Geometry, General Relativity.

Graduate Science (Colorado State University, GPA 4.0): Physiology, Histology, Anatomy, Applied Anatomy, Cadaver Dissection, Neuroanatomy.

Undergraduate Science: Physics, Biology, Molecular Biology, Chemistry, Organic Chemistry, Physical Chemistry, Analytical Chemistry, Spectroscopy and Separations, Biochemistry, Physiology, Algorithms, Data Structures.

TEACHING EXPERIENCE

Instructor of Record , Oregon State University Qualifying Exam Prep Seminar	Winter 2023 & Winter 2025
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Graduate Teaching Assistant , Oregon State University Trigonometry (Fall 2020), Differential Calculus (Winter 2021), Vector Calculus 1 (Spring 2021), Vector Calculus 2 (Fall 2021), Vector Calculus 1 (Winter 2022), Ordinary Differential Equations (Spring 2022 & Spring 2023), Integral Calculus (Fall 2022), Analysis 2 (Fall 2023), Linear Algebra (Fall 2025)	2020–Present
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Medical College Admissions Test (MCAT) Instructor , Kaplan Test Prep Other tests taught: DAT, OAT, PCAT, GMAT, GRE	2010–Present
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MCAT Summer Intensive Program, Director , Kaplan Test Prep	Summer 2014
- Organized and led summer camp for 65 MCAT students and 10 teachers. - Primary instructor, teaching in person, daily to all 65 students. - Mentored, coached, and managed the other teachers.	

PROFESSIONAL SOCIETIES

Phi Kappa Phi Honor Society	2022–Present
Society for Industrial and Applied Mathematics (SIAM)	2020–Present
American Mathematical Society (AMS)	2020–Present

BOOK EDITOR/AUTHORSHIP CREDITS

Primary Author , <i>ChemHELP</i> , <i>PhysicsHELP</i> , <i>OrgoHELP</i> , 1st Edition,	2017
Contributing Author , <i>MCAT Behavioral Sciences</i> , 7th Edition, Contribution: Chapter 11	2020
Contributing Author , <i>MCAT Lesson Book</i> , 1st Edition, Contribution: Chapter 4	2020
Editor in Chief , <i>MCAT Behavioral Sciences</i> , 8th Edition	2021
Editor in Chief , <i>ChemHELP</i> , <i>PhysicsHELP</i> , and <i>OrgoHELP</i> , 1st Edition	2017
Editor in Chief , <i>MCAT High Yield Science</i> , 2nd Edition	2016
Editor , <i>MCAT Seven Book Series</i> , 2nd–8th Editions	2015–2021
Editor , <i>MCAT 528</i> , 1st Edition	2020
Editor , <i>DAT/OAT Prep Plus</i> , 1st Edition	2016
Editor , <i>MCAT Advanced</i> , 1st Edition	2016

VIDEO PRODUCTION CREDITS

Producer , <i>Aztec: High School Equivalency</i> , 500 videos	2018
• Role: Project manager for 50 content creators and a video production crew; lead designer, lead video director. • Impact: Product sold for \$1 million against a \$300,000 budget.	
Producer , <i>HELPSuite</i> , 300 videos	2017–2018
• Role: Project manager for 20 content creators, lead designer, lead writer, lead video director, on-camera talent • Impact: Video series has amassed over 250k views on YouTube.	
Producer , <i>MCAT High Yield Science</i> , 32 videos and accompanying lessons	2015–2016
• Role: Project manager for 5 content creators, lead designer, lead writer, lead video director, on-camera talent. • Impact: These videos are the centerpiece of Kaplan’s MCAT course, a \$30 million per year product. The accompanying lessons have been taught by thousands of teachers to over half a million MCAT students.	
On-Camera Talent , <i>MCAT Next Gen</i> , 5 videos	2021
On-Camera Talent , <i>The Leitner System for Flashcards</i> , 5 videos	2020
On-Camera Talent , <i>PCAT: Chemistry</i> , 29 videos	2019
On-Camera Talent , <i>High Yield Science</i> , 11 videos	2015
On-Camera Talent , <i>MCAT: Lessons on Demand</i> , 10 videos	2014
On-Camera Talent , <i>MCAT National Marketing Campaign</i> , 1 video	2014