Jonas F. Eichinger, Ph.D.

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For publications and research, see
epc.ed.tum.de/lnm/staff/jonas-eichinger-former-member

Education

2021 **Ph.D., Computational Mechanics**, *TU Munich (Technical University of Munich, Germany)*
Passed with highest distinction (summa cum laude)
Doctoral thesis: "Micromechanical Foundations of Mechanobiology in Soft Tissues"
- Cooperated with 50+ scientific researchers in the development of a large C++ multi-physics code
- Developed a high-performance code module to simulate the mechanical interaction of slender continua
- Implemented parallelization using MPI to optimize the performance of existing code leading to a 500% gain in efficiency and orders of magnitude increase in possible problem size

2017, 2019 **Visiting Assistant in Research**, *Yale University*
- Developed the first biaxial testing device for the active response of soft tissue equivalents
- Implemented a custom software framework to automate experimental testing without user input

2015 **M.Sc., Computational Mechanics**, *TU Munich*
Passed with highest distinction (summa cum laude)
M.Sc. thesis: Interface representation and stability of an immersed boundary method for fluid-structure interaction
Areas of concentration: Computational Mechanics, Numerical Methods

2012 **B.Sc., Mechanical Engineering**, *TU Munich*
Areas of concentration: Engineering Mechanics, Higher Mathematics, Thermodynamics, Computer Science

Professional Experience

Since 2021 **Product Design FEA (Finite Element Analysis)**, *Apple (Vision Products Group)*
- Optimizing Apple Vision Pro performance and user experience by conducting simulations using FEA
- Collaborating with cross-functional teams and external partners, including product design, research centers, and universities, giving technical support and advancing our simulation methods
- Led introduction of git/GitHub for all scripting efforts across multiple teams of 80+ people

2021 **Postdoctoral Researcher**, *TU Munich*
- Restructured large parts of the code base using modern C++ techniques to increase efficiency and reliability
- Directed research by mentoring Ph.D. students in scientific projects

2016 – 2021 **Research Assistant**, *TU Munich*
- Built a new area of research within the group from scratch
- Led introduction of coding best practices such as version control, code review, and (unit) testing
- Organizer and chair of all presentations and research meetings within the group
- Directed research by mentoring students in scientific projects leading to B.Sc. and M.Sc. theses

2017 – 2021 **Teaching Assistant**, *TU Munich*
- Designed and taught Master's level classes such as Engineering Mechanics and Computational Biomechanics
- Created a new Master's level course about visualization techniques in Computational Mechanics

2012 **Student Trainee**, *PwC (PricewaterhouseCoopers)*
- Developed an automated tool for analyzing company data to uncover opportunities for improvement
- Reduced manual labor for data analysis from multiple hours to a few minutes

Skills

Expertise Computational modeling, nonlinear finite element analysis, software development, high-performance parallel computing, material modeling, optimization, computational fluid dynamics

Programming Proficient in C++, C, Python, LabVIEW, MATLAB, git, svn; Basic knowledge of PyTorch, bash

Software Proficient in Linux, Abaqus, ANSA, META, ParaView, VS Code, Latex

Languages German (native), English (C2), Spanish (B1)

Journal Articles

A8. Paukner D, **Eichinger JF**, Cyron CJ. What are the key mechanical mechanisms governing integrin-mediated cell migration in three-dimensional fiber networks?, *Biomechanics and Modeling in Mechanobiology*, 2023. DOI

A7. Davoodi Kermani I, Schmitter M, **Eichinger JF**, Aydin RC, Cyron CJ. Computational study of the geometric properties governing the linear mechanical behavior of fiber networks, *Computational Materials Science*, 2021. DOI

A6. **Eichinger JF**, Paukner D, Aydin RC, Wall WA, Humphrey JD, Cyron CJ. What do cells regulate in soft tissues on short time scales?, *Acta Biomaterialia*, 2021. DOI

A5. **Eichinger JF**, Grill MJ, Davoodi Kermani I, Aydin RC, Wall WA, Humphrey JD, Cyron CJ. A computational framework for modeling cell-matrix interactions in soft biological tissues, *Biomechanics and Modeling in Mechanobiology*, 2021. DOI

A4. Grill MJ, **Eichinger JF**, Koban J, Meier C, Lieleg O, Wall WA. A Novel Modeling and Simulation Approach for the Hindered Mobility of Charged Particles in Biological Hydrogels, *Proceedings of the Royal Society A*, 2021. DOI

A3. **Eichinger JF**, Haeusel LJ, Paukner D, Aydin RC, Humphrey JD, Cyron CJ. Mechanical homeostasis in tissue equivalents - a review, *Biomechanics and Modeling in Mechanobiology*, 2021. DOI

A2. **Eichinger JF**, Paukner D, Szafron JM, Aydin RC, Humphrey JD, Cyron CJ. Computer-Controlled Biaxial Bioreactor for Investigating Cell-Mediated Homeostasis in Tissue Equivalents, *Journal of Biomechanical Engineering*, 2020. DOI

A1. Philipp A, **Eichinger JF**, Aydin RC, Georgiadis A, Cyron JC, Retsch M. The accuracy of laser flash analysis explored by finite element method and numerical fitting, *Heat and Mass Transfer*, 2019. DOI

Conference Abstracts and Invited Talks

P6. **Eichinger JF**, Aydin RC, Humphrey JD, Cyron CJ. Experimental Study and Computational Modeling of Soft Tissue Mechanical Homeostasis, *14th World Congress in Computational Mechanics and ECCOMAS Congress 2020 (14th WCCM ECCOMAS Congress 2020)*, Paris, France (virtual), 2021.

P5. **Eichinger JF**, Paukner D, Aydin RC, Humphrey JD, Cyron CJ. Experimental Analysis and Computational Modeling of Soft Tissue Tensional Homeostasis, *8th GACM Colloquium on Computational Mechanics (GACM 2019)*, Kassel, Germany, 2019.

P4. **Eichinger JF**, Paukner D, Aydin RC, Humphrey JD, Cyron CJ. Key Factors for Soft Tissue Tensional Homeostasis Identified by Discrete Fiber Network Modeling and Biaxial Experiments, *90th Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM 2019)*, Vienna, Austria, 2019.

P3. **Eichinger JF**, Aydin RC, Humphrey JD, Cyron CJ. Soft Tissue Tensional-Homeostasis in Experiment and Simulation, *Society of Engineering Science (SES) Technical Meeting 2018*, Madrid, Spain, 2018.

P2. **Eichinger JF**, Aydin RC, Humphrey JD, Cyron CJ. Micro-Scale Modeling of Cell-Extracellular Matrix Interactions, *World Congress on Computational Mechanics (WCCM 2018)*, New York, USA, 2018.

P1. **Eichinger JF**, Humphrey JD, Cyron CJ. Mechanical Homeostasis in Soft Tissues, *American Society for Matrix Biology (ASMB) e-Symposium; Matrix Math: Computational Modeling of the ECM*, March, USA (online), 2021.

Student Research Mentoring

Doctoral candidates

2021	**Daniel Paukner**, Micromechanical Foundations of Tensional Homeostasis.	*TU Munich*
Since 2020	**Barbara Wirthl**, Global Sensitivity Analysis for Complex Biomechanical Problems.	*TU Munich*

Master's theses (six months)

2018	**Daniel Paukner**, Design and Validation of a Biaxial Bioreactor for Cell Seeded Collagen Gels.	*Yale University*

Semester theses (three months)

2019	**Lydia Ehmer**, Study of Tensional Homeostasis in Higher Dimensions Using Cell Seeded Collagen Gels.	*Yale University*
2017	**Daniel Paukner**, Simulation of the Brownian Dynamics of Slender Biopolymers using Beam Finite Elements.	*TU Munich*

Bachelor's theses (three months)

2020	**Lea Häusel**, Study of Cell-mediated Homeostasis in Tissue Equivalents in Computer-controlled Biaxial Tests.	*Yale University*
2019	**Lydia Ehmer**, Simulation of viscoelastic behavior of acellular collagen gels and quantitative comparison with experimental results, Bachelor's Thesis .	*TU Munich*
2017	**Niklas Klinkertz**, Equilibrium Morphologies of Semiflexible, Transiently Crosslinked, Heterogeneous Biopolymer Networks.	*TU Munich*
2016	**Daniel Paukner**, Analysis and Solution Strategies for Added-Mass Instabilities in Partitioned FEM Schemes for Fluid-Structure-Interaction.	*TU Munich*
2016	**Johannes Schwarz**, Computational Modelling of Gastric Electrophysiology.	*TU Munich*

Student projects

2019	**Jonas Koban**, Implementation and Validation of a C++ Tool to create fiber networks based on Voronoi Tesselation.	*TU Munich*