Júlio O. Amando de Barros, Ph.D.

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About

Physicist specialized in materials and biomaterials science with a Ph.D. in progress at ETH Zürich and an M.Sc. from USP, Brazil. I bring a solid track record in experimental and numerical research, project coordination, teaching assistance, and scientific computing, including custom data acquisition and image processing in Python. My interdisciplinary expertise spans from ab initio simulations to wood anatomy, modeling, and mechanical testing, allowing me to connect theory with practical experimentation. My overall organizational impact lies in delivering solid physical insights, applying data-driven reasoning, and determining the most suitable approaches to solve complex problems. I foster a culture of collaboration, continuous learning, and rigorous scientific thinking.

Work Experience

Mar 2022 – current **ETH Zürich** Ph.D. Candidate/Research Assistant

- Developed a phenomenological model based on principles of wood anatomy, unifying different mechanical phenomena and their dependence on moisture changes and moisture gradients.
- Applied micromechanical experimental techniques to test the wood cell wall behavior, we identified crucial error sources of the method, and established protocols to correctly characterize structured organic material.
- Developed a microtensile testing setup with integrated climate control, PID-based load control, and a low-cost digital microscopy system for image acquisition and deformation analysis.
- Teaching assistance on Computational Scientific Investigation and Finite Element Methods. Bachelor's Thesis supervision.

Jul 2019 – Dez 2021 **University of São Paulo** MSc. in Physics

- Performed Molecular Dynamics simulations of cellulose fibrils in ionic liquids for energy harvesting technologies.
- Combined ab-initio and Molecular Dynamics simulations to study functionalized cellulose fibrils and amino acids interactions for controlled drug release.
- Teaching assistance on Experimental Physics and Physics of Heat.

Fev 2016 – Jul 2019 **University of São Paulo** Undergraduate Research Program

- Performed Dynamical Mechanical Analysis on Brazilian hardwoods, analysing their frequency and temperature dependence.
- Performed quantitative wood anatomy characterization and compared mechanical and anatomical properties using dimensionality reduction and clustering techniques to identify key features.

Education

Mar 2022 – current	**ETH Zurich** Ph.D. in Wood-water interactions from a micromechanical perspective Advisor: Prof. Ingo Burgert and Dr. Falk K. Wittel
Jul 2019 – Dec 2021	**University of São Paulo** M.Sc. in Physics - Theoretical studies on cellulose fiber interactions with drugs and ions Advisor: Prof. Kaline Coutinho
Fev 2014 – Fev 2019	**University of São Paulo** B.Sc. in Physics

Technical Strengths

Programming Languages	Python	●●●●●○
	C++, Bash, MATLAB	●●○○○○
Software Skills	Linux, SSH, Git, ABAQUS, LabVIEW, Arduino, GROMACS, Gaussian, Mathematica, Blender, Illustrator, AEM Website Manager, MS Office	
Experimental Experience	Optical and Electron Microscopy, Focused Electron Beam-Induced Deposition (FEBID), Focused Ion Beam Milling (FIB), Nanoindentation, Microtensile Testing, Dynamic Mechanical Analysis (DMA), Microtoming, Ultramicrotoming, and various biological sample preparation techniques.	

Other Information

Languages	Portuguese	Native
	English and Spanish	Advanced
	German	Intermediary

Teaching assistant roles

- Materials in construction: Finite Element Methods Lab. (ABAQUS and Python) (2024-2025) (Dr. Falk Wittel).
- Computational Scientific Investigation (Python) (2023-2025) (Prof. David Kammer and Dr. Falk Wittel).
- Physics of Heat (2019) (Prof. Kaline Coutinho)
- Experimental Physics (2017-2019) (Prof. Leandro Barbosa)

Highlighted academic events

- Oral Presentations in Computational Methods in Wood Mechanics - ECCOMAS Thematic Conference (2023 and 2025)
- English Courses for Presentations and Writing (2019-2024)
- Course on *Machine Learning Techniques Applied to Computational Materials Science with Hands-on* (2020)
- **Student Travel Grant** in 61st SWST International conference (2019).

Other engagements

- Musician, playing drums and Brazilian ukulele in my free time.
- Outdoor activities, such as white water kayaking and hiking.
- Member of the executive board of an association to organise and foster musical events in Zürich.

Selected Publications

Please refer to Google Scholar [link] for full list and updated citation count.

Amando de Barros, J.*, Wittel, F.* Unifying model for the rheological behavior of hygroresponsive materials. Physical Review E. 2024; 109(4):044139. https://doi.org/10.1103/PhysRevE.109.044139

Amando de Barros, J.*, Schwiedrzik J., Wittel F.* Resolving Discrepancies in Wood Micromechanics: Strain-Mapped Compression of Tracheid Wall Micropillars. Composites Part A. 2025. https://doi.org/10.1016/j.compositesa.2025.109209