

Individual Narrative Profile

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Personal Statement:

As a former student of the École Normale Supérieure (ENS) Paris-Saclay (Mechanical Engineering), I chose a research-intensive training program and quickly specialized in Biomechanics. My core expertise lies in poromechanical and multiscale modeling of soft biological tissues, focused on characterizing complex time-dependent mechanical behaviors in tissues like human skin and skeletal muscle, with direct applications in pressure ulcer prevention and tissue engineering.

My training included several research projects (4-10 month internships) that led to early publications and conference talks. Interacting with researchers not only reinforced my passion for innovation in solving societal issues but also emphasized the importance of knowledge sharing. This led me to pursue outreach, starting with mentoring high school students for competitive national exams at the Lycée Hoche.

I recently earned a Dual Doctoral Degree (Docteur en Sciences de l'Ingénieur) through a Co-tutelle PhD (2022-2025), recognized with the 2025 Excellent Thesis Award from the University of Luxembourg and proposed for the Prox Béziers (ENASM Paris). The project, Biomechanical modelling of human skin: a hierarchical porous media framework, allied theoretical developments, numerical assessments, and international collaboration, with a special care on reproducibility and open-source research. I am committed to continuing this research trajectory in upcoming post-doctoral roles, including a CNRS ANR Rosaly Post-Doctoral Researcher (12/2025-2027) position focusing on hydrogel characterization.

Personal details – Individual narrative profile:

I entered the ENS Paris-Saclay in 2018 and gained fundamental knowledge in mechanical science. My first major research step was a 6-month internship with François Hild (Laboratoire de Mécanique Paris-Saclay - LMPS), which culminated in a "most cited" peer-reviewed publication. My growing interest in biomechanics led to a 4-month internship with Sébastien Laporte (Institut de Biomécanique Humaine George Charpak - IBHGC). This exposure was a pivoting point, motivating me to pursue specialized biomechanical research. I enrolled in the Master of Science in Biomechanics (Master 2) within the BME Paris program. My subsequent 6-month internship with Pierre-Yves Rohan (IBHGC) and Giuseppe Sciume (Institut de mécanique et d'ingénierie - I2M) resulted in several publications, including a first-author article. My research continued with a 10-month research internship at the Legato Team (Luxembourg) under the supervision of Stéphane Bordas. This work, which focused on soft tissue modeling and breast deformation, led to a successful international collaboration with the LMPS. This background was crucial for my Co-tutelle PhD project, which successfully developed international collaborations between the Université du Luxembourg, ENSAM Paris, and the University of Bordeaux (I2M). This sustained project work has reinforced my research experience and deepened my vision for my chosen field that I can pursue as a Post-Doctoral researcher.

Key outputs, contributions, and achievements:

Contributing to the generation and communication of new ideas, hypotheses, tools, or knowledge – I have made early and sustained contributions to research in mechanical and biomechanical fields, characterized by cross-disciplinary technique transfer and a commitment to open science. My most significant contribution is my dual-degree PhD work in Porous Media Modeling, which

successfully achieved the coupling of mechanics and biology (microvascular response) using a hierarchical porous media framework to model human skin. This project provided novel, fundamental insights into the time-dependent, ischemic, and hyperemic responses of human skin to external load, without introducing neurological effects. Crucially, this advanced modeling was developed as an open-source tool, furthering accessibility and reproducibility in the field. I was able to extend techniques commonly used in solid mechanics to new biomechanical applications. For instance, my work in Digital Volume Correlation (DVC) involved adapting this technique to capture breast deformation from medical imagery. This successful technique transfer was a core component of my 10-month internship supervised by Stéphane Bordas (Highly Cited Researcher since 2014). The project involved a comprehensive methodology: literature review, image processing (CT-scans, segmentation, DVC), patient-specific meshing, Finite Element Modeling (FEM) of inverse and forward hyper-elastic tissue motion, sensitivity analysis, calibration, and neural networks. This collaborative effort between the Legato Team and LMPS was for instance accepted for oral communication at the 9th World Congress of Biomechanics. My research quality is evidenced by my Peer-Reviewed Outputs, which include early publications in high-impact journals such as the Journal of Strain Analysis and Clinical Biomechanics, and numerous conference talks. I have contributed to the work of recognized researchers, including François Hild and Pierre-Yves Rohan (Young Researcher Award of the Society of Biomechanics in 2021). Furthermore, I have participated in the rigorous process of scientific quality control by serving as a reviewer for scientific journals, an activity that further hones my critical evaluation skills.

Contributing to the development and sustainability of research teams and individuals – Beyond my core research, I actively contribute to the scientific ecosystem and education through mentoring, team development, and the clinical translation of research findings. My commitment to training the next generation is demonstrated through my Mentoring and Teaching activities. In parallel with my studies at ENS, I served as an Oral Examiner for a class preparing for competitive national entrance exams at the Lycée Hoche (Versailles, France). I found this experience rewarding, as it allowed me to contribute to the training of younger students and help them choose their orientation, especially when they sought information about Research. I provided weekly contact, advising small groups of students on my university program and associated opportunities. I also participated in the Lycée Hoche school forums, presenting my curriculum, the research field, and possibilities for post-school orientation. I have taught L3, M1, and M2 level courses in mathematics and (bio)mechanics. This commitment also extends to my publication record, as I co-authored a book designed for the preparation of oral exams in classes préparatoires. I actively promote Research Collaboration & Tool Development to enhance team productivity and efficiency. As part of the biomechanical teams (Legato Team and I2M Porous Modelling team), I designed tutorials and symposiums to help in the learning and use of advanced computational tools such as GIT (for version control) and FEniCSx (for finite element method solutions). Furthermore, I leveraged my interdisciplinary background to participate in diverse international studies, including those on breast chemotherapy, brain growth, brain porous modeling, and microfluidic chips design and simulations. Finally, I ensure my research maintains Clinical Relevance by focusing on applications with significant societal concerns. My PhD work specifically seeks to propose improvements for pressure ulcer prevention. To better understand the importance of this topic and advance the clinical aspect of my work, I participated in several meetings with Pierre-Yves Rohan at the Institut National des Invalides (Paris), with the goal of developing future clinical collaborations.