

# Master Student in Microfluidics (m/f/d)

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*We are recruiting an ambitious **master thesis student** who wants to pursue groundbreaking research in the areas of bioengineering . It will be based in the laboratory of Abdel Rahman Abdel Fattah at **CeMM Research Center for Molecular Medicine of the Austrian Academy of Sciences in Vienna**.*

## The Project

The function, and dysfunction, of the neurovascular unit (NVU) barrier is central to post-traumatic injury progression. This project introduces a bioengineered microphysiological platform designed to integrate a structured neuronal compartment with a functional vascular barrier in a controlled three-dimensional environment. By engineering spatial organization and vascular perfusion from the outset, we aim to establish an in vitro NVU model in which barrier formation, maintenance, and breakdown can be systematically studied.

To achieve this, we will iteratively design and fabricate microfluidic platforms using CAD-based modeling and in-house 3D printing to generate molds for device production. We will optimize biomaterial composition and mechanical properties to support neuronal compartment stability, vascular maturation, and self-organized interface formation between neural and endothelial components. Functional validation will include quantitative assessment of barrier integrity and permeability, as well as analysis of neurovascular responses using live imaging and molecular profiling. Ultimately, this work will generate a controllable human NVU platform suitable for studying injury dynamics, vascular dysfunction, and tissue remodeling, with implications for mechanistic neuroscience, disease modeling, and therapeutic development.

## Your Profile

We are seeking a motivated and talented Master's student with a strong background in bioengineering, cell biology, biomedical engineering, or a related field. Experience in mammalian cell culture is essential, and familiarity with hydrogel systems, extracellular matrices, microfabrication, microscopy, or computational design is highly desirable. The student will work closely with a postdoctoral researcher in a highly collaborative environment and gain hands-on experience in microphysiological system design, biofabrication, and functional validation of engineered tissues.

The project requires a commitment of 9-12 months and offers the opportunity to contribute to cutting-edge interdisciplinary research at the interface of engineering and neuroscience, with strong potential for co-authorship in a high-impact publication.

## The Abdel Fattah Lab

We are a multidisciplinary group studying tissue organization at the [CeMM Research Center for Molecular Medicine](#). We exist at the interface of engineering and biology and we are driven by the question: **how do cells use the extracellular matrix and mechanical forces to collectively coordinate, initiate, and maintain tissue organization, and what happens when forces are too much to handle?** We particularly focus on how local mechanical conditions instruct tissue organization through global morphological and cell state changes, but also tissue disorganization in conditions such as liver fibrosis and traumatic brain injuries. We take three approaches to address this **(1) we engineer our own platforms** to mechanically stimulate and measure local and emerging mechanical properties in tissues, **(2) we explore mechanobiology across the scales** in-vitro, going from multicellular events to molecular drivers, in order to characterize and study the dynamic relationship between cells and their extracellular matrix (ECM) microenvironment, **(3) we develop computational models** to explore the physical laws and logic used by cells to organize, in our effort to establish the mechanical roadmap to tissue organization. In our quest to answer these questions we use magnetic and fluid/solid mechanics engineering principles to build tools that allow us to locally mechanically stimulate cells, deliver traumatic injuries as well as measure local mechanics. Next we focus on quantifying multicellular dynamic cell-ECM interactions using a combination of time-lapse microscopy, high content image analysis, and neighborhood analyses. We explore the driving molecular programs that drive these interactions by combining transcriptomics with mechanical data in mechano-transcriptomics maps. Finally, we describe the organization strategies employed by cells from a mechanical standpoint through computational models using positional information, cellular automata and reaction diffusion models. Our main research topics include central nervous system health, traumatic brain and spinal cord injuries, and liver fibrosis. We utilize several in-vitro model systems, with a primary focus on those derived from human pluripotent stem cells. Our team is composed of 1 Principal Investigator (Abdel), 2 Postdocs (Dunja and Sowmya), 1 PhD Student (Negar), and 1 Research Technician (Sabrina).

## The Principal Investigator

Abdel Rahman Abdel Fattah joined CeMM in 2022 as a Postdoc in the Lab of Giulio Superti-Furga where he focused on the metabolic dimension of fate mechanoregulation. In 2024 Abdel became a Principal Investigator at CeMM. He studied Mechanical Engineering at McMaster University (Canada) and gained industry experience in the renewable energy industry in Ontario. He then returned to McMaster University to complete his Ph.D. in the laboratory of Prof. Ishwar K. Puri, where he combined magnetic and fluid dynamics theories to manipulate synthetic and biological materials, fabricate mechanically anisotropic polymers, print carbon-nanotube biosensors, and bioprint 3D cellular constructs for tissue engineering applications. For his postdoctoral studies, Abdel joined the Lab of Morphogenesis and Bioengineering at KU Leuven (Belgium) under the mentorship of Prof. Adrian Ranga. There, he focused on the mechanoregulation of neural tube development. He developed high throughput actuatable hydrogel-embedded human neural tube organoid models using engineered stretching devices (producing global stresses) or embedded magnetic microactuators (producing local internal stresses) showing 1) that patterns of FOXA2+ floorplate cells are enhanced by timed and active mechanical forces in 2 kPa hydrogels and 2) that force location acts as a frame of reference for symmetry breaking and dorsovental (PAX6-FOXA2) patterning in organoids. Combining engineering and transcriptomic analysis revealed key ROCK1 and MYH9 mechano-responding molecular drivers involved in FOXA2 pattern enhancement. At the same time, integration of an in-silico patterning model revealed the importance of positional information in floorplate patterning and multicellular organization in neural tube organoids. He went on to investigate the relationship between epithelial morphogenesis, symmetry-breaking events and extracellular matrix (ECM) dynamics, revealing the importance of ECM flow as

a feedback mechanism that reinforces and guides cell patterning and morphogenesis, and shapes the transcriptomic landscape in a pre-streak-like epithelial model system in-vitro. Now, the Abdel Fattah lab focuses on understanding how cells navigate a mechanical roadmap to initiate, achieve, and maintain tissue organization in health and disease. The team is leading this research direction by building new bioengineering tools, profiling transcriptomic landscapes, and bridging the multicellular and molecular dimensions of the mechanoregulation of tissue organization. Previously, Abdel received the FWO Junior Postdoctoral Fellowship (2019-2022), his Ph.D. work helped secure several grants (2016-2020) such as the Ontario Center of Excellence, NSERC and Engage grants. Recently, he received the FWF Alternative Methods to Animal Testing (2025-2028) grant to research brain trauma using organoids, and he holds a patent for a magnetic cell bioprinting technology (2023).

## About the Institute

CeMM is an international research institute of the Austrian Academy of Sciences and a founding member of EU-LIFE. The mission of CeMM, the Research Center for Molecular Medicine of the Austrian Academy of Sciences is to achieve maximum scientific innovation in molecular medicine to improve healthcare. At CeMM, an international and creative team of scientists and medical doctors pursues free-minded basic life science research in a large and vibrant hospital environment of outstanding medical tradition and practice. At CeMM, an international and creative team of scientists and medical doctors pursues free-minded basic life science research in a large and vibrant hospital environment of outstanding medical tradition and practice. CeMM's research is based on post-genomic technologies and focuses on societally important diseases, such as immune disorders and infections, cancer, aging and metabolic disorders. CeMM operates in a unique mode of super-cooperation, connecting biology with medicine, experiments with computation, discovery with translation, and science with society and the arts. CeMM discovers and develops technologies to explore human biology with the purpose of defeating disease at its roots. Because Science is our Medicine! CeMM trains a modern blend of biomedical scientists and is located at the campus of the General Hospital and the Medical University of Vienna. CeMM is a proud recipient of the HR Excellence in Research Award (HRS4R). This award indicates that CeMM takes care of the well-being of its employees, that the recruitment process is open, fair, and transparent, and that CeMM offers professional appraisals and career development procedures. More than 150 people from 47 nationalities are working at CeMM. The institute promotes equal opportunity and harbors a mix of different talents, backgrounds, competences, and interests. [www.cemm.at](http://www.cemm.at)

## We offer

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- A wide range of social, cultural, and sports activities organized by the institute
- Excellent employee benefits including full insurance coverage (health, accident, retirement), health care services, subsidized cafeteria
- Monthly gross salary of EUR 1.379,60 for 20 hours/ week (following the [recommendations of FWF](#))
- Support for relocating to Vienna is provided (relocation reimbursement, visa support, etc.)

Please apply online (<https://cemm.onlyfy.jobs/job/w5lksff4>) with cover letter, CV , certificates (high school & university Diploma/grades)and contact details of 2 referees. Any application received by May 24 2026 will be considered.

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### Additional information

|               |                    |
|---------------|--------------------|
| City          | Vienna             |
| Position type | Part-time employee |
| Start of work | 01.08.2026         |

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### Responsible

Memo Mokhles

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