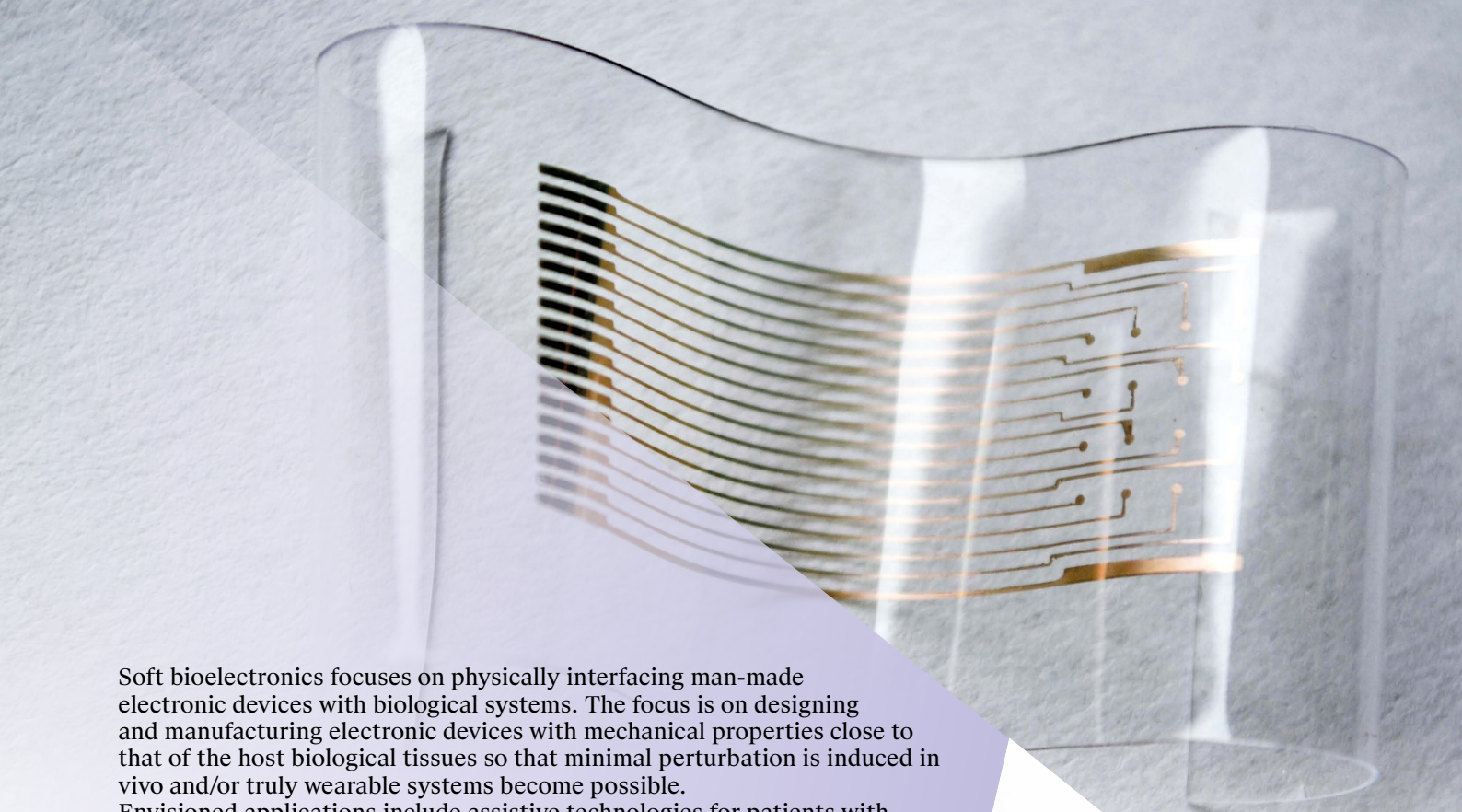
DOCTORAL SCHOOL

MICROSYSTEMS AND MICROELECTRONICS

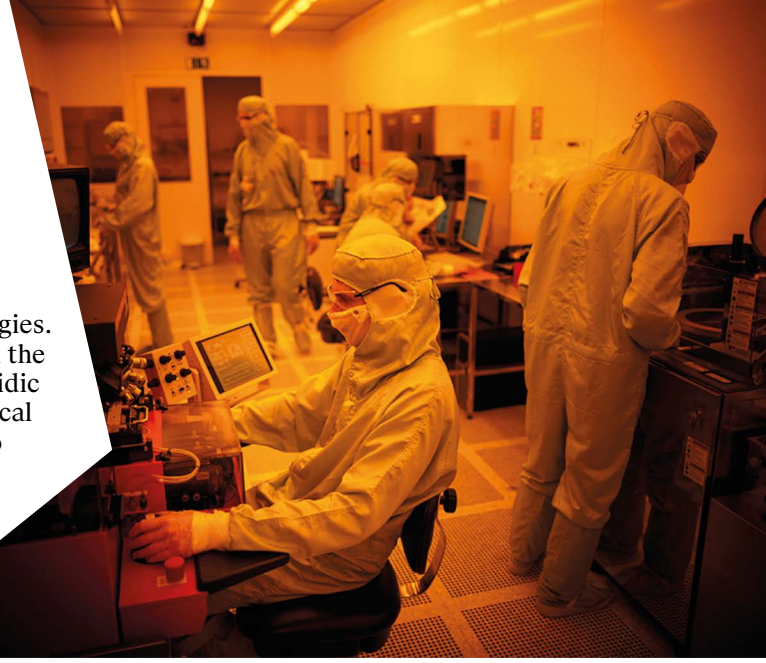
EPFL



Soft bioelectronics focuses on physically interfacing man-made electronic devices with biological systems. The focus is on designing and manufacturing electronic devices with mechanical properties close to that of the host biological tissues so that minimal perturbation is induced in vivo and/or truly wearable systems become possible.
Envisioned applications include assistive technologies for patients with impaired nerves or spinal cord injuries in the form of soft implantable electrodes, and wearable interfaces in skin-like formats for prosthetic sensory skins.
We use fabrication methods borrowed from the microelectronics and MEMS industry and adapt them to soft substrates like elastomers.
We develop novel characterization tools adapted to mechanically compliant bioelectronic circuits.
Moving soft bioelectronics forward requires innovation in the fields of materials science, fabrication, engineering, and biocompatibility, and a multidisciplinary mindset.

Prof. Stéphanie P. Lacour,
Bertarelli Foundation Chair in Neuroprosthetic Technology
Centre for Neuroprosthetics
EPFL - STI - IMT/IBI - LSBI

Our doctoral program (EDMI) covers a wide range of research topics ranging from MEMS to digital circuit design and is at the intersection of micro/nanoelectronics, micro/nanosystems, and bioengineering. Interdisciplinarity and technological innovation constitute core priorities of our doctoral program.



I first came to EPFL during my Master's in Micro and Nanotechnologies for Integrated Systems, an incredible experience that allowed me to discover the value of sharing science with people from all over the world. Since then, I realized that the EDMI program would provide me a great opportunity to pursue my interest in micro- and nanotechnologies. As a doctoral student at NANOLAB, my research is focused on the development of innovative transistors embedded in a microfluidic platform for sensing applications. After a first year of theoretical investigation, I had the opportunity, through my laboratory, to manufacture the sensors myself in the EPFL-CMi cleanroom. in the CMi, I operated state-of-the-art microfabrication machines for the realization of my project. Working in such an environment has been a very fulfilling experience. Often, my objectives seemed unreachable, but being surrounded daily by a cooperative team of experts full of enthusiasm was one of the key factors which enabled my work – and myself – to progress. It took a few weeks to get familiar with the cleanroom staff and users. In such a friendly environment, I had the chance to exchange opinions on common difficulties and also to learn about many other innovative projects from different fields. Today, after four years of doctoral studies, I am gathering pictures of the devices I fabricated and reviewing the results to finalize my thesis. Not only am I proud of my achievements but I am also confident that future PhD students will continue this development, eventually creating a health care product.

Sara Rigante,
EPFL – STI – IEL – NANOLAB

Mario Chavarria Varon,
EPFL – STI – IMT – LMIS1

I am a second year PhD student in the Microsystems Laboratory 1. My work focuses on the development of a system that allows the simultaneous topographical and chemical analysis of samples in the nanometer range. To be part of this project is a very enriching experience. I have the chance to work with and learn from very gifted people. Thanks to EPFL's recognition and excellent collaboration relations I had the opportunity to visit different laboratories in other countries, such as China and Japan, and to host foreign researchers in our laboratory. This has been very helpful in order to build an active and prolific knowledge exchange network. The working environment is highly passionate and motivating. When I first came here from Colombia, I didn't know anybody and I was worried about dealing with a more cold and distant social culture than I was used to. However, I was happily surprised by the kindness and friendliness of my colleagues. From day one they have been very supportive and welcoming. Also, the EPFL community is so multicultural that you can easily blend in and stop feeling foreign. During the past year and a half I have realized that doing research at EPFL can be quite demanding but being at the forefront of science is really worth the effort.

Laboratory of Bionanophotonic Systems	BIOS, Prof. Hatice Altug
Embedded Systems Laboratory	ESL, Prof. David Atienza Alonso
Galatea Laboratory	GALATEA, Prof. Yves Bellouard
Magnetic resonance at Micro- and Nano-scale Group	MRMN Group, Dr. MER Giovanni Boero
Telecommunications Circuits Laboratory	TCL, Prof. Andreas Peter Burg
Photonic Systems Laboratory	PHOSL, Prof. Camille Brès
MEMS and Printed Microsystems Group	LMTS, Dr. MER Danick Briand
Microsystems Laboratory 1	LMIS1, Prof. Juergen Brugger
Integrated Systems Laboratory	LSI1, Prof. Sandro Carrara
Laboratory of Information and Inference Systems	LIONS, Prof. Volkan Cevher
Advanced Quantum Architecture Laboratory	AQUA, Prof. Edoardo Charbon
Integrated Systems Laboratory	LSI, Prof. Giovanni De Micheli
Radio Frequency Integrated Circuit Group	RFIC Group, Prof. Catherine Dehollain
Laboratory of the Physics of Living Matter	LPMV, Prof. Giovanni Dietler
Ferroelectrics and Functional Oxides Group	FFO Group, Prof. Damjanovic Dragan
Integrated Circuits Laboratory	ICLAB, Prof. Christian Enz
Laboratory for Bio- and Nano-Instrumentation	LBNI, Prof. Georg Fantner
Laboratory of Intelligent Systems	LIS, Prof. Dario Floreano
Swiss Space Center	SSC, Prof. Volker Gass
Medtronic Chair in Neuroengineering	LNE, Prof. Diego Ghezzi
Microsystems Laboratory 2	LMIS2, Prof. Martin Gijs
Laboratory of Life Sciences Electronics	CLSE, Prof. Carlotta Guiducci
Patek Philippe Chair in Micromechanical and Watch Design	INSTANT-LAB, Prof. Simon Henein
Nanoelectronic Devices Laboratory	NANOLAB, Prof. Adrian M. Ionescu
Electronics Laboratory	ELAB, Prof. Maher Kayal
Nanoscale Electronics and Structures	LANES, Prof. Andras Kis
Engineering Mechanics of Soft Interfaces	EMSI, Prof. John Kolinski
Laboratory for Soft Bioelectronic Interfaces	LSBI, Prof. Stéphanie P. Lacour
Microelectronic Systems Laboratory	LSM, Prof. Yusuf Leblebici
Laboratory of Biological Network Characterization	LBNC, Prof. Sebastian Maerkl
Power and Wide-band-gap Electronics Research Laboratory	POWERLAB, Prof. Elison Matioli
Mattavelli Multimedia Group	MM Group, Dr. MER Marco Mattavelli
Laboratory of Quantum Materials	QMAT, Prof. Philip Moll
Laboratory of Applied Photonics Devices	LAPD, Prof. Christophe Moser
Reconfigurable Robotics Laboratory	RRL, Prof. Jamie Paik
Integrated Actuators Laboratory	LAI, Prof. Yves Perriard
Photonic Micro- and Nanosystems	GR-QUA, Prof. Niels Quack
Laboratory of Nanoscale Biology	LBEN, Prof. Aleksandra Radenovic
Microsystems Laboratory 4	LMIS4, Prof. Philippe Renaud
MicroBioRobotic Systems Laboratory	MICROBS, Prof. Selman Sakar
Emerging electron devices modelling group Group	Modeling Group, Dr. MER Jean-Michel Sallese
Soft Transducers Laboratory	LMTS, Prof. Herbert Shea
Laboratory for Applied Mechanical Design	LAMD, Prof. Jürg Alexander Schiffmann
Bioelectronics and neuromorphic systems Group	BNS Group, Dr. MER Alexandre Schmid
Integrated Neurotechnologies Laboratory	INL, Prof. Mahsa Shoaran
Nanoelectronic Devices Laboratory	NANOLAB, Dr. MER Igor Stolichnov
Laboratory for Advanced Fabrication Technologies	LAFT, Prof. Vivek Subramanian
Advanced Nano-electromechanical Systems Laboratory	NEMS, Prof. Guillermo Villanueva

Research

Our research in microsystems is mainly based on the development of new, and the use of existing, micro- and nanotechnologies. This know-how is further developed in a large variety of application domains that benefit from precision engineering at the micrometer and nanometer scale. Our activities include the development of devices and micro components and their integration into functional microsystems and machines that can be applied in fields such as health, security and the environment, medical devices, communications, space applications, the watch industry, and many others.

Our research in microelectronics has circuits and devices, power and energy as major technical topics. Integrated circuit technology is present in many industrial products, while telecommunication circuits and systems enable information technology to shape the interactions of people all over the world. Also energy generation and distribution is a key technology to meet our demand for electrical power while respecting the environment limitations.

The large number of successful collaborations with industries active in fields as diverse as biomedical engineering, watch making, spatial exploration, security, or energy production indicates our capacity to bridge the gap between fundamental research and industrial production.

Specificities of the EDMI program:

There is no specific date to start a PhD in the EDMI program. Changes to the application deadlines may apply. For the most recent information, please refer to the program's webpage.

Both BSc and MSc are eligible. However, the enrollment of BSc candidates, who should demonstrate an outstanding academic record, is exceptional and the final decision will be taken exclusively by the Microsystems and Microelectronics Doctoral Program Commission.

The EDMI application file includes the opinion of three referees on the candidate. A referee is a senior researcher or professor who has affinity with supervision of researchers and/or PhD students.

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