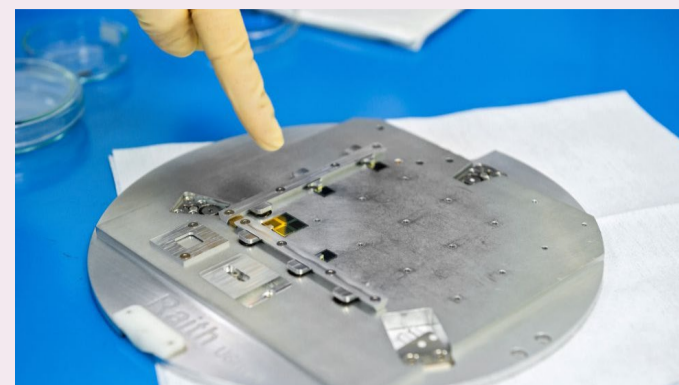


## MaP Doctoral School science & technology of the small



### 1 Science & Technology of the Small

#### Harnessing material properties at the micro- and nanoscale

- At the micro- and nanometer scale, materials behave differently from their bulk form, with quantum effects emerging as dimensions shrink.
- Changes in material properties occur when external dimensions approach internal length scales like grain size, dislocation curvature, or mean free paths.
- Quantum mechanical effects arise when particles like electrons or photons are confined to dimensions comparable to their wavelength.
- Micro- and nanotechnologies enable innovations like quantum dots for bright displays, nano-magnets for data storage, solid-state batteries for electric vehicles, and sensors for air quality monitoring.

### 3 Events and Courses

#### Current and past events

- Visit to the new ETH Basel campus
- ISOE Summer School, Cargèse
- Small track seminars
- Workshop on scientific storytelling
- 'First-principles Modelling of Defects in Solids' conference

→ [www.doctoral-school.ethz.ch/events](http://www.doctoral-school.ethz.ch/events)

**Search result: Course units in Autumn Semester 2024**

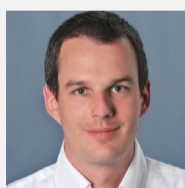
Number	Title	Type	ECTS	Hours	Lecturers
151-0409-00L	Multiphysics Modeling and Simulation	W	4 credits	2V + 2U	C. L. Roman
151-0509-00L	Acoustics in Fluid Media: From Robotics to Additive Manufacturing	W	4 credits	3G	D. Ahmed
151-0604-00L	Microrobotics	W	4 credits	3G	B. Nelson
151-0620-00L	Embedded MEMS Lab	W	5 credits	3P	C. Hierold, A. Güntner, M. Haluska
151-0621-00L	Microsystems I: Process Technology and Integration	W	6 credits	3V + 2U	M. Haluska, C. Hierold
151-0913-00L	Introduction to Photonics	W	4 credits	2V + 2U	R. Quidant, J. Ortega Arroyo
227-0053-00L	High-Frequency Design Techniques	W	4 credits	2V + 2U	C. Bolognesi, T. Popovic
227-0110-00L	Electromagnetic Waves: Materials, Effects, and Antennas	W	6 credits	4G	
227-0157-00L	Semiconductor Devices: Physical Bases and Simulation	W	4 credits	3G	A. Schenk, C. L. Roman
227-0311-00L	Qubits, Electrons, Photons	W	6 credits	3V + 2U	T. Zambelli

### 2 Organisation and Focus

#### Track co-chairs

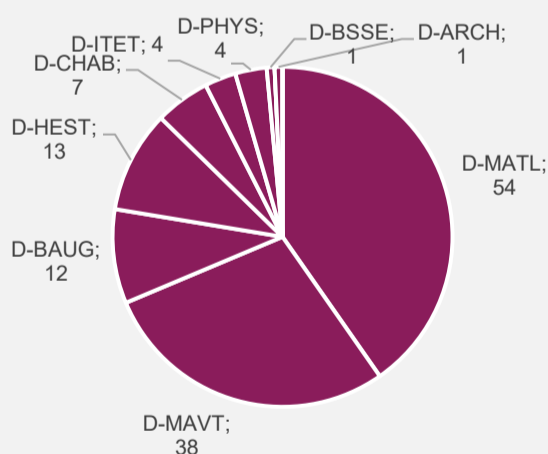


Prof. Dr. Ralph Spolenak  
Nanometallurgy, D-MATL

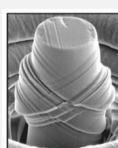


Prof. Dr. Mathieu Luisier  
Computational Nanoelectronics, D-ITET

#### Doctoral students in track



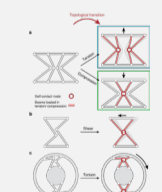
#### Selected Research Topics



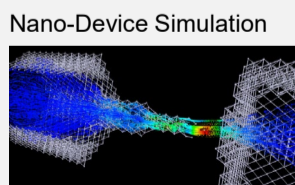
Micro-Mechanics



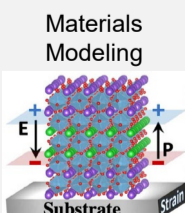
Light Technologies



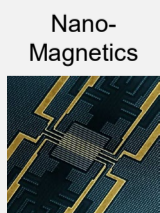
Reconfigurable Metamaterials



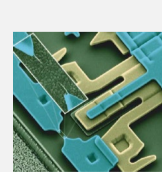
Nano-Device Simulation



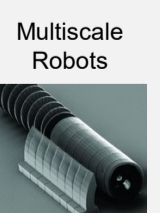
Materials Modeling



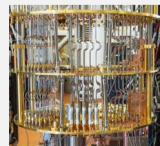
Nano-Magnetics



Micro- and Nano-Systems

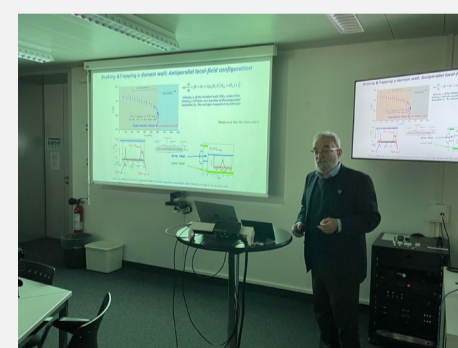


Multiscale Robots



Quantum Computing

### 4 Impressions



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[map.ethz.ch](http://map.ethz.ch)