

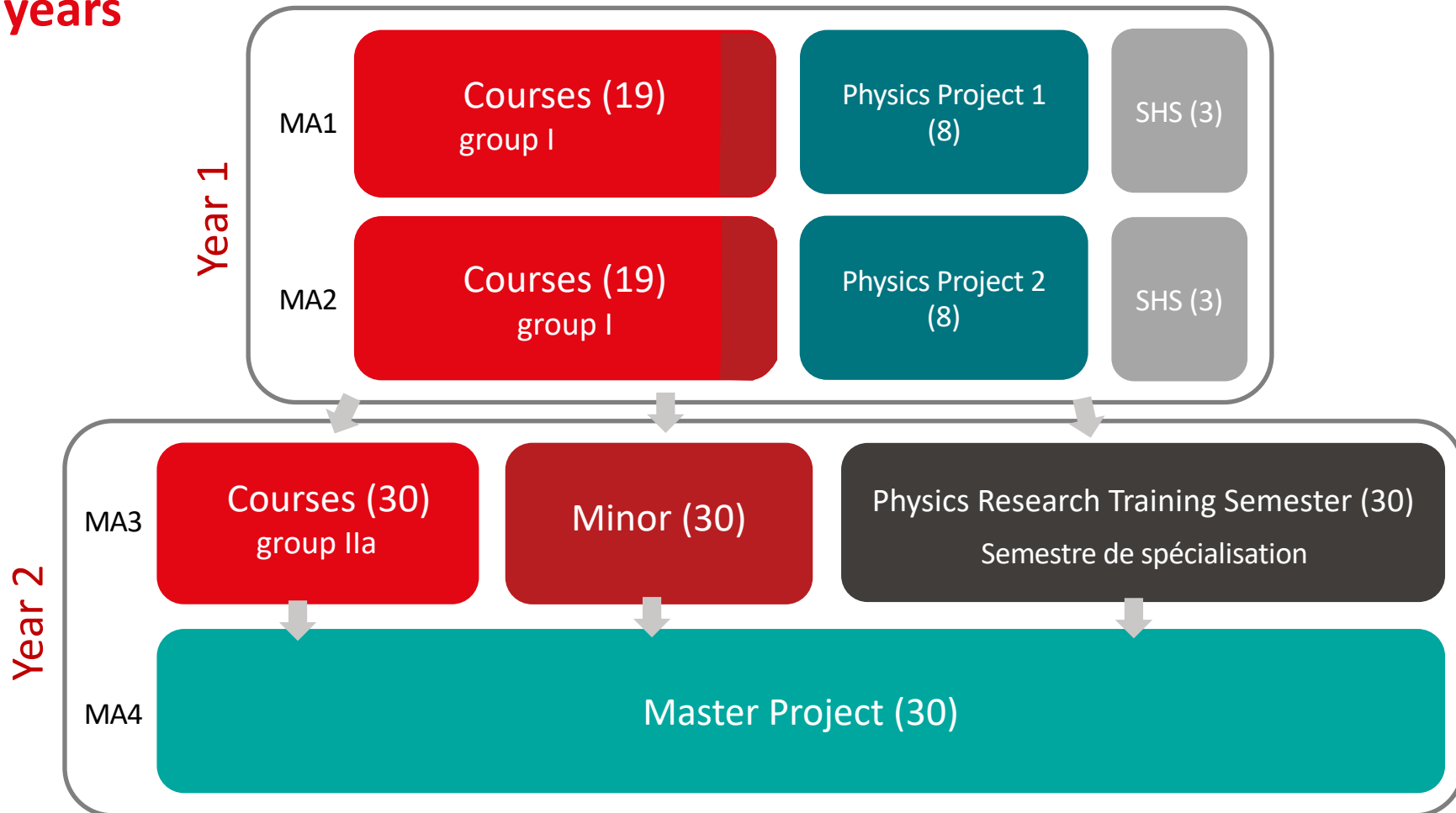
# EPFL

Master in Physics  
Master in Applied Physics  
2024-2025

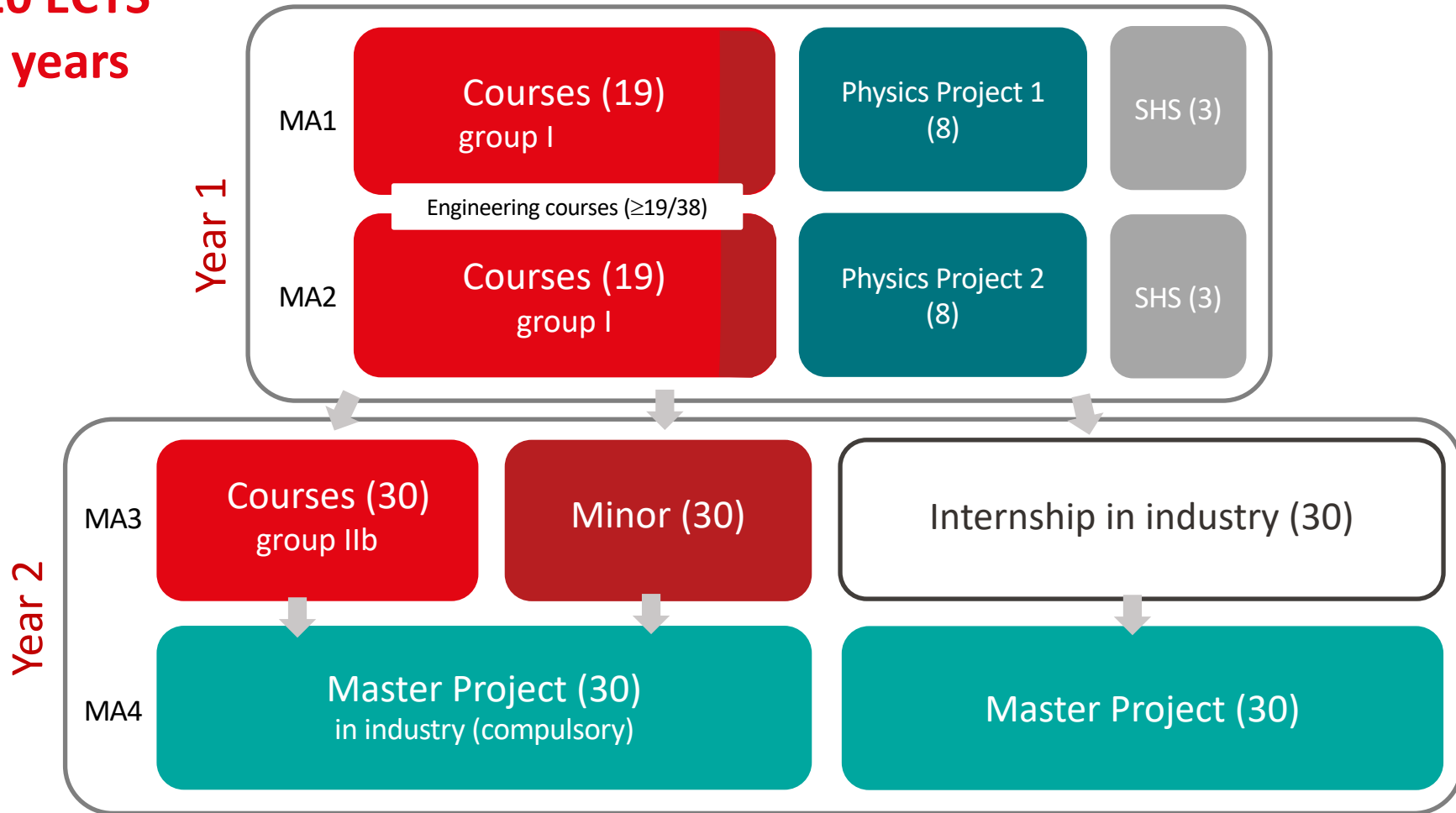
# Physics

120 ECTS

2 years



# Applied Physics 120 ECTS 2 years



# Fall Semester (MA1/MA3)

  : Engineering courses

Code 6XX: advanced courses

	Astrophysics, Particles, High energy Physics	Plasma Physics and Energy	Physics of Biological and Complex Systems	Condensed Matter Physics	Quantum Science and Technology
<b>6 ECTS</b>	Quantum Field Theory I - 431 Relativity Cosmology I - 427 Quantum Physics III - 425	Plasma I - 423	Statistical Physics III - 435	Adv. Solid State Physics I - 419 Quantum Physics III - 425	QED & Quantum Optics - 453 Adv. Solid State Physics I - 419 Quantum Computing - 541
<b>4 ECTS</b>	Astrophysics III - 401 Particle Physics I - 415 Intr. Particle Accelerators - 448 Particle detection - 440 Computer simulation - 403 Machine Learning Physics - 467 Design of Experiments - 442	Nucl. Fusion&Plasma Physics - 445 Neutron scattering – 640 Microwave Eng. - QUANT 410 Radiation biology - 450 Particle detection - 440 Computer simulation - 403 Machine Learning Physics - 467 Radiation detection - 452	Radiation biology - 450 Stat. Ph. biomacromolecul. - 441 Biophysics: biol. sys. - 302 Stat. Phys. Computation - 512 Computer simulation - 403 Machine Learning Physics - 467 Design of Experiments - 442	Semiconductor Physics - 433 Physics of Materials - 307 Microwave Eng. - QUANT 410 Neutron scattering – 640 Computer simulation - 403 Machine Learning Physics - 467 Quantum transport - 462 Design of Experiments - 442	Semiconductor Physics - 433 Lasers - MICRO 422 Quantum transport - 462 Microwave Eng. - QUANT 410 Math of quantum Physics - 469 Computer simulation - 403 Machine Learning Physics - 467 Design of Experiments - 442
<b>3 ECTS</b>				Exp. methods in Physics. - 405 Frontiers in NanoSciences - 407	Exp. methods in Physics - 405 Frontiers in NanoSciences - 407

# Spring Semester (MA2)

Engineering courses : Engineering courses

	Astrophysics, Particles, High energy Physics	Plasma Physics and Energy	Physics of Biological and Complex Systems	Condensed Matter Physics	Quantum Science and Technology
6 ECTS	<ul style="list-style-type: none"> <li>Quantum Field Theory II - 432</li> <li>Quantum Physics IV - 426</li> <li>Relativity Cosmology II - 428</li> </ul>	<ul style="list-style-type: none"> <li>Nonlinear dynamics, chaos - 460</li> <li>Plasma II - 424</li> </ul>	<ul style="list-style-type: none"> <li>Nonlinear dynamics, chaos - 460</li> </ul>	<ul style="list-style-type: none"> <li>Statistical Physics IV - 436</li> </ul>	<ul style="list-style-type: none"> <li>Statistical Physics IV - 436</li> <li>Quantum Optics ... - 454</li> </ul>
4 ECTS	<ul style="list-style-type: none"> <li>Astrophysics IV - 401</li> <li>Particle physics II - 416</li> <li>Introd. Astroparticles - 439</li> <li>Selec. topics Nucl. Particle - 400</li> <li>Astrophysics V - 402</li> </ul>		<ul style="list-style-type: none"> <li>Fund. Biomedical imaging - 438</li> <li>Physics of Life - 468</li> </ul>	<ul style="list-style-type: none"> <li>Adv. Solid State Physics II - 420</li> <li>Comput. Quantum Phys. - 463</li> <li>Magnetism in Materials - 491</li> </ul>	<ul style="list-style-type: none"> <li>Phys. Photonic. Devices - 434</li> <li>Comput. Quantum Phys. - 463</li> <li>Solid Stat. Syst. Q. Infor. - 464</li> <li>Quantum Information - 550</li> <li>Nonlinear Optics - 470</li> </ul>
3 ECTS			<ul style="list-style-type: none"> <li>Topics in Biophysics - 466</li> </ul>	<ul style="list-style-type: none"> <li>Electron microscopy – MSE 450</li> </ul>	

# Choice of courses

## Optional Courses

- **options SPH** : in the study plan :
- **options FSB** : in mathématiques (SMA), Chemistry and Chemical Engineering (SCGC) schools + list of courses approved out of FSB
- **options other faculties** : schools of the other faculties of EPFL.

Constraints for courses chosen outside the Physics Study Plan

- **max 18** credits among FSB + list of approved courses out of FSB+other faculty courses
- **max 6** credits among bachelor optional courses
- **max 6** credits among options in other faculties, submitted to Physics school director approval

### Master Cycle in Physics and Applied Physics requires

- **38 credits** obtained in option courses
- **22 credits** obtained in lab courses (16) et projects SHS (6)

**+ Internship in INDUSTRY (Applied Physics) or Research Training Semester (Physics) 30 credits**

**or Minor (Applied Physics and Physics) 30 credits**  
**or 3rd study semester (Applied Physics and Physics) 30 credits**

**+ Master Project 30 credits**

The choice of the TP4 lab and Master Project must be announced to the School secretariat

# Research Training Semester

Under the supervision of a Professor or Senior Scientist (MER) of the PH School

No grade but success with 30 ECTS or fail

- It can be performed internally (Physics lab) or outside EPFL (lab or research institute)
- The Professor responsible for such work can require that the student takes some courses relevant for the specialisation

# Internship for engineers only

Internship subjects must be approved by the Physics School

A wide database of subjects proposed by companies is available

No grade, but success with 30 ECTS or fail

- Under full responsibility of the company supervisor
- At the end, the student must provide a manuscript and make an oral presentation of the work in front of the school supervisor and the company audience that will evaluate the internship



For your calendar:

**Internship presentation**

**Monday 23rd Sept. at 12h15  
in room CE1 2**

## 3rd study semester

Aimed at student who would like to take additional specialty courses

- For Engineers: other courses in Applied Physics + courses of Engineering School (according to list)
- For Physicists: other courses in Physics + master courses of Engineering School + doctoral courses (max. 2)

# Master Project and Physics Project (TP4)

- **Art. 10 - Laboratoires de Physique IV**

Le choix du laboratoire pour les Laboratoires de Physique IVa et IVb ainsi que le Projet de master doit être annoncé à la Section de Physique et validé par celle-ci.

In principle, TP4 are performed in a [lab](#) of the Physics School  
Short presentations are available with this [link](#)

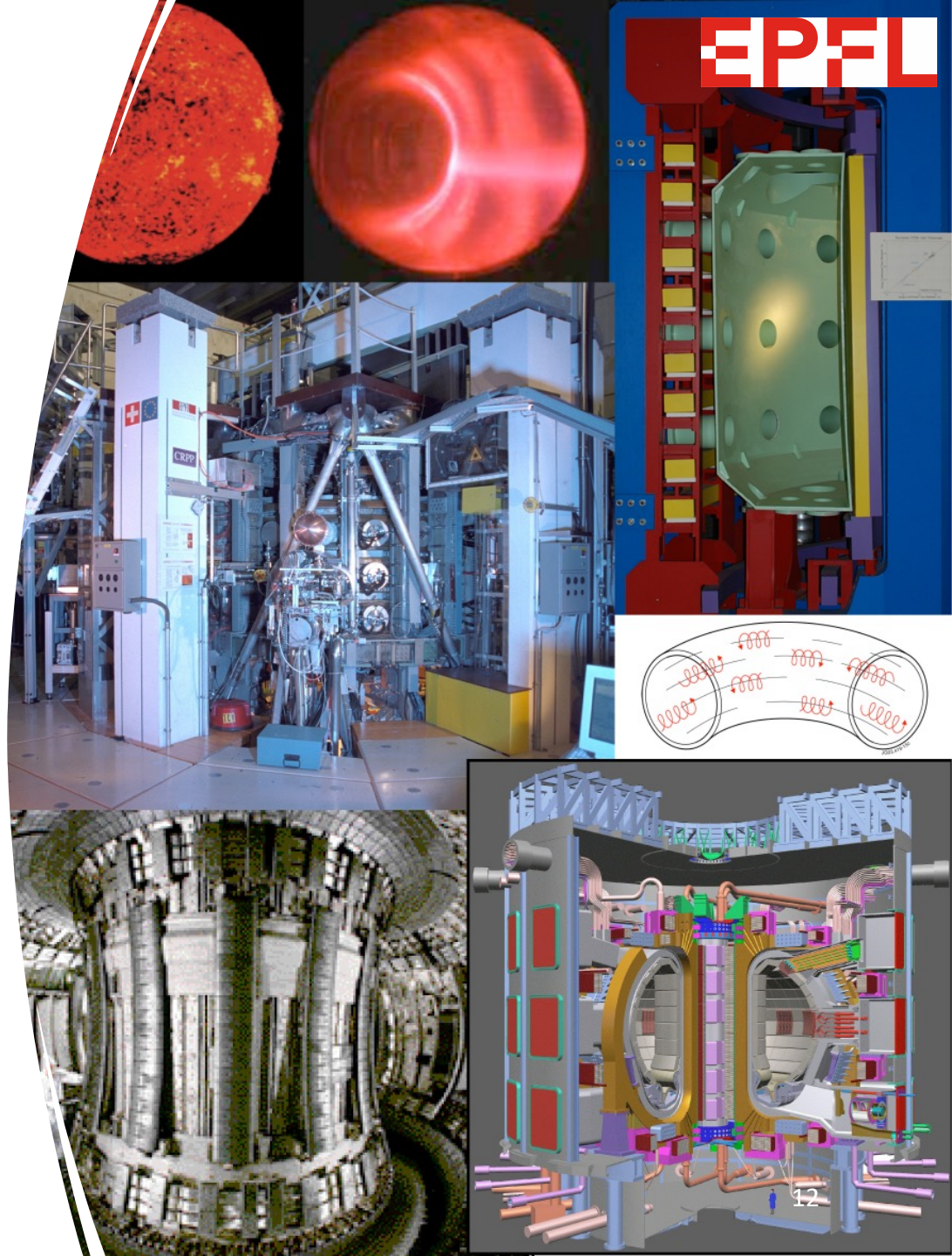
## Art. 2 – Étapes de formation

- Le master en physique est composé de deux étapes successives de formation : le cycle master d'une durée de trois semestres .....
- ... le projet de master d'une durée de 17 semaines à l'EPFL ou de 25 semaines hors EPFL, et dont la réussite implique l'acquisition de 30 crédits. Il est placé sous la responsabilité d'un Professeur ou d'un MER affilié à la section de Physique.

The Master Project is under the supervision of a Professor or Senior Scientist (MER) of the Physics School

# Plasma Physics, fusion and fission

- Prof. Ambrogio Fasoli
- Prof. Paolo Ricci
- Prof. Laurent Villard
- Prof. Christian Theiler
- Prof. Ivo Furno
- Prof. Andreas Pautz
- Dr. Jean-Marc Moret
- Dr. Basil Duval
- Dr. Stefano Coda
- Dr. Stefano Alberti
- Dr. Jonathan Graves
- Dr. Jean Philippe Hogge
- Dr. Stephan Brunner
- Dr. Olivier Sauter
- Dr. Holger Reimerdes



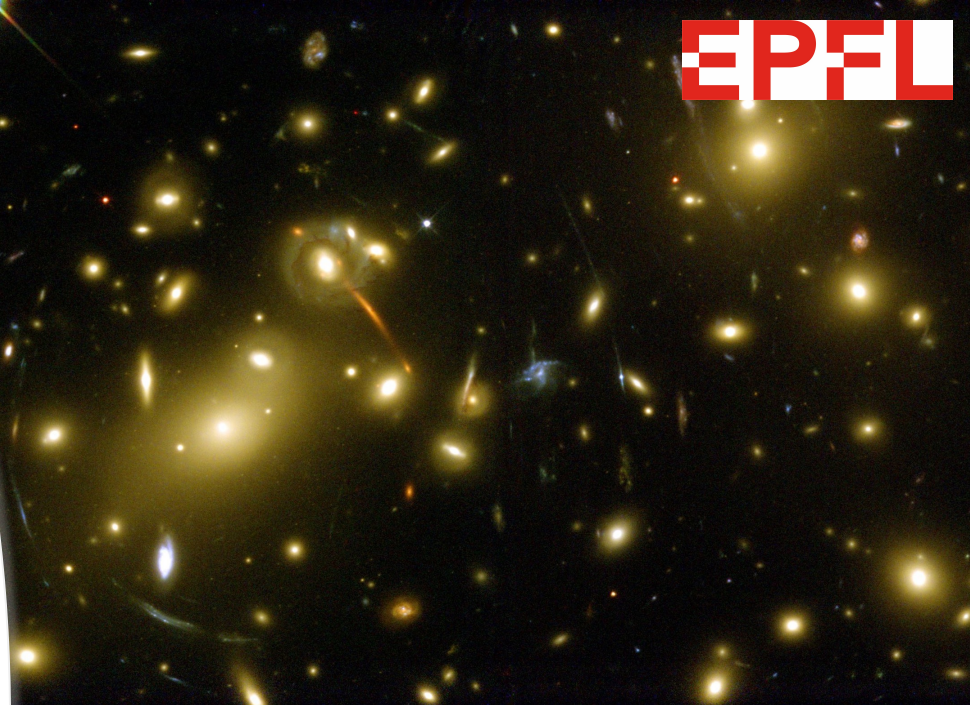
# Astrophysics and Particle Physics

## Particle physics

- Prof. Olivier Schneider
- Prof. Riccardo Rattazzi
- Prof. Lesya Shchutska
- Prof. Mike Seidel
- Prof. Viktor Gorbenko
- Prof. Radoslav Marchevski

## Astrophysics

- Prof. Jean-Paul Richard Kneib
- Prof. Pascale Jablonka
- Prof. Frédéric Courbin
- Prof. Joao Miguel Penedones
- Prof. Michaela Hirschmann
- Prof. Richard Anderson
- Dr. Yves Revaz
- Prof. Pierre North

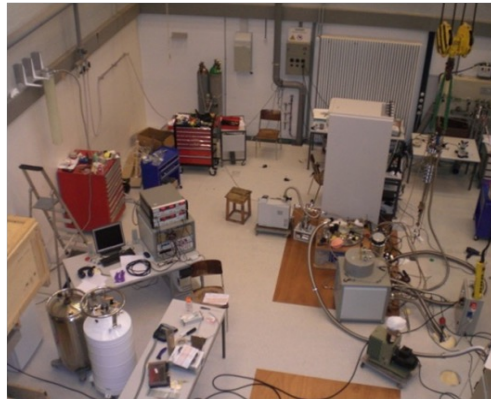
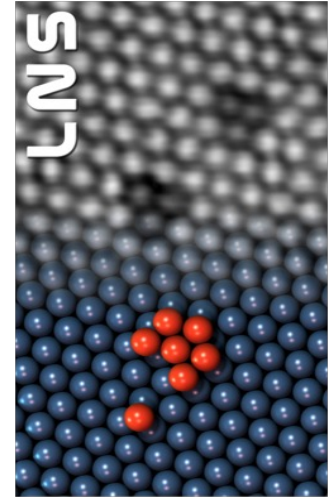


# Condensed Matter Physics



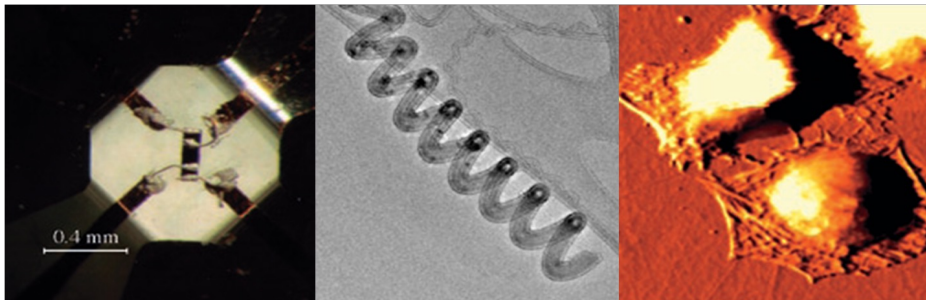
*Nanostructures with well defined size, shape and composition*

- Prof. Harald Brune (nanostructures)
- Prof. Cécile Hébert (electron microscopy)
- Prof. Hugo Dil
- Dr. Stefano Rusponi



*Novel materials including superconductors, soft matter and high-pressure phases*

Prof. Henrik Ronnow  
Prof. Daniele Mari  
Dr. Arnaud Magrez



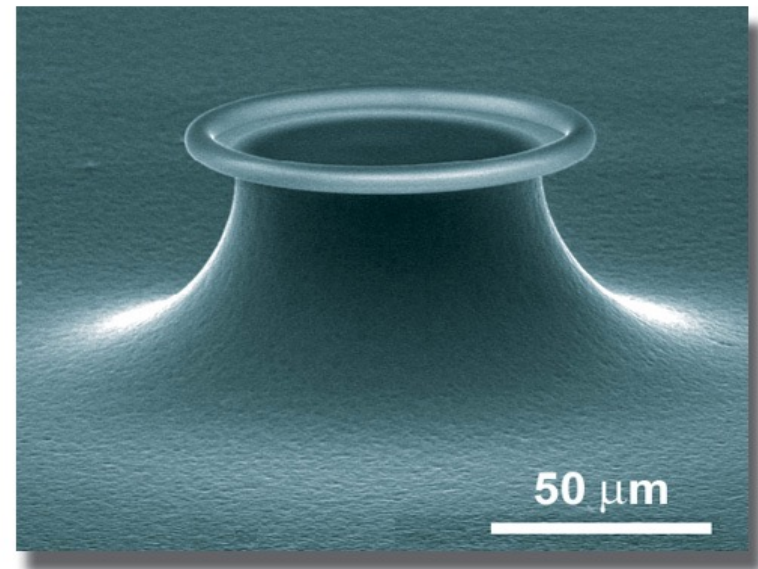
# Condensed Matter Physics

## *Quantum devices and quantum photonics*

- Prof. Fabrizio Carbone
- Prof. Gabriel Aeppli
- Prof. Mitali Banerjee

## *Theory and simulation*

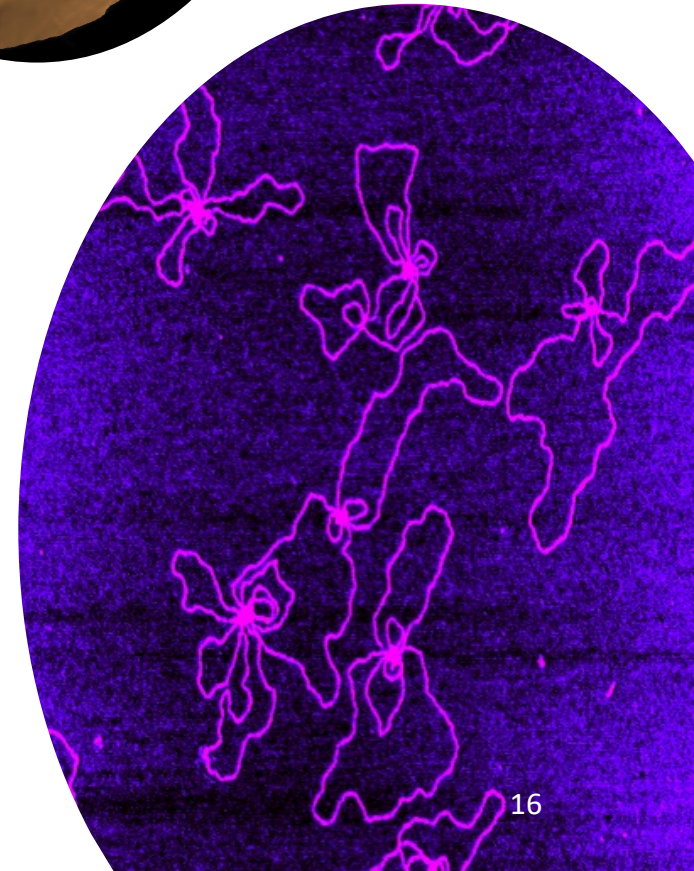
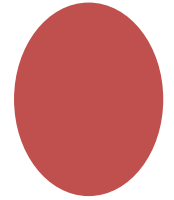
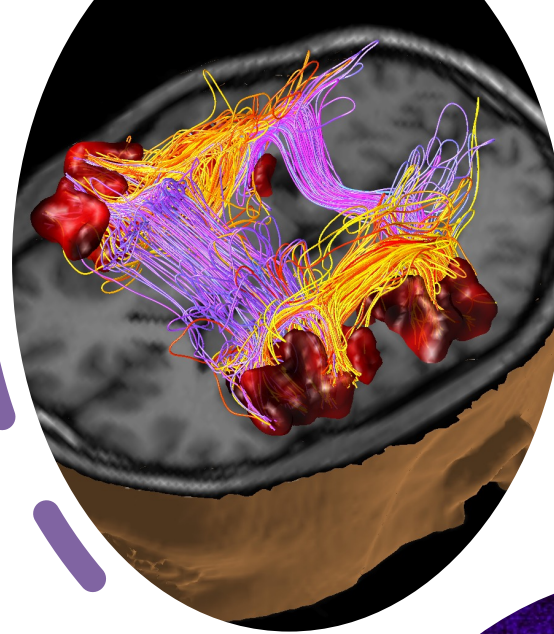
- Prof. Frédéric Mila
- Prof. Alfredo Pasquarello
- Prof. Oleg Yazief
- Prof. Andreas Läuchli
- Prof. Manuel Guizar Sicaïros
- Prof. Christopher Marc Mudry



# Physics of Biological and Complex Systems

*function, structure and properties of biological systems*

- Prof. Hennig Stahlberg
- Prof. Paolo De Los Rios
- Prof. Suliana Manley
- Prof. Rolf Gruetter (LIFMET)
- Prof. Sahand Jamal Rahi
- Prof. Florent Krzakala
- Prof. Lenka Zdeborová
- Prof. Mathieu Wyart
- Prof. Guillermina Ramirez-San-Juan

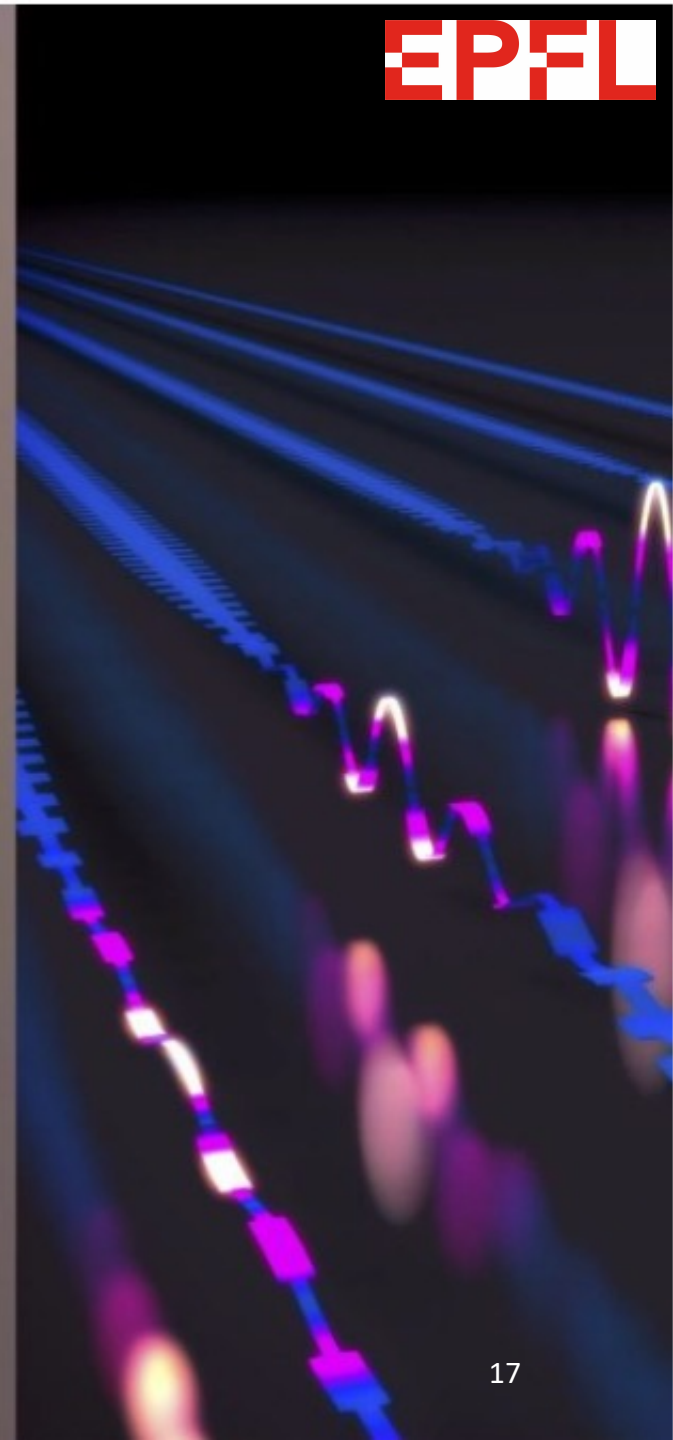
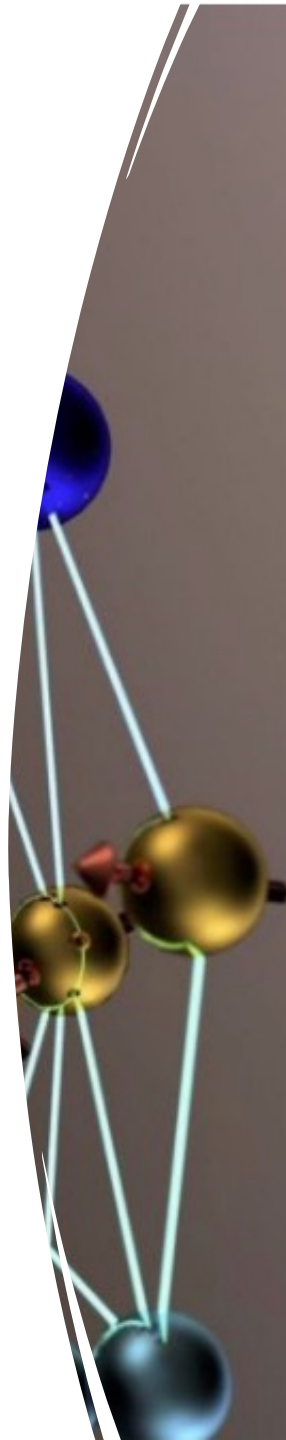




# Quantum Science and Technology

*Photonics, quantum computing,  
quantum matter*

- Prof. Jean Philippe Brantut
- Prof. Vincenzo Savona
- Prof. Giuseppe Carleo
- Prof. Zoe Holmes
- Prof. Christophe Galland
- Prof. Tobias Kippenberg
- Prof. Pasquale Scarlino
- Prof. Nicolas Grandjean
- Prof. Vladimir Manucharyan
- Dr. Raphael Butté





CdH EPFL

sept 10

# SHS program

## Need of SHS competences ! ?

- Any engineering project is related to society, worldwide.
- Many are involving cutting edge science.
- Thus, acting as engineer, scientist or manager requires SHS competences,

*probably more than ever !*

## Competences: OK, but of which kind ?

- Understanding practices, norms, values and history of social environnements (*cultural*)
- Knowing the rules and habits in which one works (*practical*)
- Learning other ways of reasoning (*intellectual*)
- Developing the hability to perceive and express emotions (*emotional*)

## **Basic informations & rules**

### **SHS Project**

**Group work introduced by courses/seminars  
Planned on an annual basis  
(semestrial project ? Ask your professor)**

### **Credits**

**6 ECTS given at the end of the academic year**

### **Language of courses/seminars**

**French, or english.**

### **Language of interaction/redaction**

**French, english (other commonly agreed)**

### **Evaluation**

**Usually a mix of project process, final report and presentation.**

- Inscription **1 option via IS ACADEMIA**
- CDH web site **[www.epfl.ch/cdh](http://www.epfl.ch/cdh)**
- Office **CM 1 222 (Centre Midi)**
- Opening hours **Tuesday and Thursday 14h – 17h30**



For all information (check the website before asking to the section desk)

[sph.epfl.ch](http://sph.epfl.ch)

[master.epfl.ch](http://master.epfl.ch)

Contact : [daniele.mari@epfl.ch](mailto:daniele.mari@epfl.ch) [valerie.schaererbusinger@epfl.ch](mailto:valerie.schaererbusinger@epfl.ch)