



Specialty CELL PHYSICS

An integrated program with physicists, biologists, chemists, mathematicians.

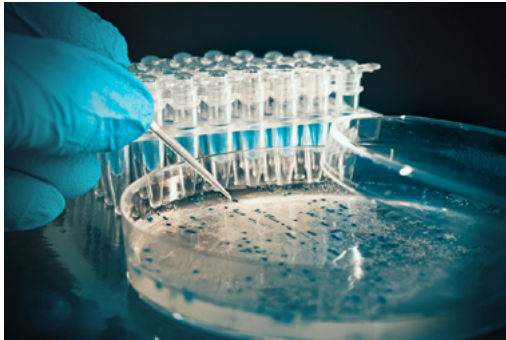


Presentation:

Objectives of this year program are to train students in physics, biology, chemistry, and maths, with practicals. The focus is targeted on biological functions and translations between scientific fields.

Topics: Systems biology, Cell physics, Developmental biology, Statistical mechanics, Collective effects, Experimental physics, Chemical biology.

Practicals: Molecular biology, Cell biology, Developmental biology, Numerical simulations, Machine shop, Microfabrication and microfluidics, Electronics, Imaging.



Practicals for the design of key experiments in Cell physics.

Access and recruitment:

- ♦ **Entry level:** academic files and interview; eligible through master I or equivalent diploma.
- ♦ **Duration of training:** 2 years.
- ♦ **Enrollment procedure:** online inscription via Aria (<https://aria.u-strasbg.fr>).

Targeted skills:

Students who will graduate from this program will have a deep understanding of living matter and its complexity. With basics at the beginning of the year in biology, physics, maths, chemistry, and the students from any scientific backgrounds will be prepared to follow lectures by 20 lecturers from Europe in this integrated course. Each week, a master meeting will allow to debate ideas in lectures and in the field. Introductions to scientific writing and patents will be given throughout the year.

Job opportunities:


This program prepares for doctoral studies in France and abroad. It leads to jobs in the public and private sectors (scientists, engineers, lecturers, project managers, journalists).



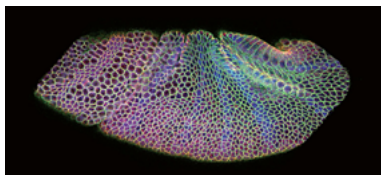
Electronics and systems biology studies identify functions in biological networks.

Cell physics


Subjects taught:

Master 1:  (common to all specialties, lectures in French)

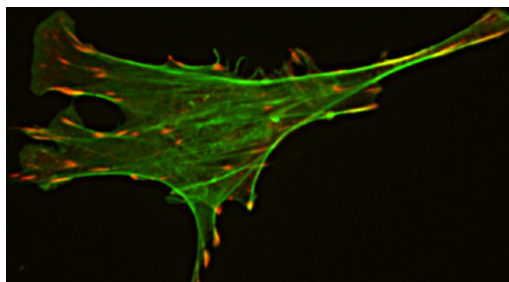
- Quantum mechanics and statistical physics (112 h).
- Programming and simulation (66 h).
- Experimental physics (60 h).
- 2 optional courses (28 h each): Mechanics of continuum media, Objects of the universe and their observation, Group theory, Ionizing radiation and detection methods, General relativity, Nanostructures and nanophysics, Computational applications in physics, Advanced quantum mechanics and statistical physics, Quantum many-body problems, Critical phenomena and non-equilibrium statistical physics.
- Possibility to complete the necessary basis in quantum mechanics and statistical physics for students with different backgrounds (32 h).
- Nuclear matter, elementary particles and condensed matter (112 h).
- Physics in labs (16 days).
- Current research topics in physics (28 h).
- 3 optional courses (28 h each): Particles and astroparticles, Physics of stars, Physics of living matter, Atomic and molecular physics, Project supervised, Relativistic quantum mechanics, Numerical applications in physics.



A fly embryo in development – Cells are outlined with fluorescent proteins at the cell-cell junctions.

Master 2:  (lectures in English)

- Basics in Physics / Biology / Maths / Chemistry are given in September.
- Then students follow lectures in Physics of living matter (60 h), Systems biology and classics in cell physics (60 h), Chemistry for grafting and screens (20 h), Maths for biology (20 h) until February.
- The lectures gather and bridge formalisms and experiments for active gels dynamics, tissue rheology, origin of life, force measurements, collective effects and Navier-stokes equation, systems biology.



The actomyosin cytoskeleton (in green) allows the cell to adapt its shape to the local environment.

Laboratory internship:

Internships start in March and typically 60 offers are received for about 10 students accepted in the Cell physics master.

Management Board:

Daniel Riveline, Physics, Strasbourg
Joseph Schacherer, Biology, Strasbourg.
Nicolas Giuseppone, Chemistry, Strasbourg.
Laurent Navoret, Maths, Strasbourg.

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