



# LAPHIA

Laser and Photonics  
in Aquitaine



université  
de BORDEAUX



INSTITUT  
d'OPTIQUE  
GRADUATE SCHOOL



**The strength of a university is partly related to its research, meaning the creation of knowledge that it can then pass on and disseminate.**

## Preparing the future

Higher education and research are key levers in achieving a new form of growth that is smarter, more sustainable and more inclusive, with the goal being to prepare for a knowledge society in which future generations can achieve fulfilment.

The University of Bordeaux and its partners intend to address this challenge by shaping a campus of excellence with an international reputation, uniting its research forces around high-level scientific pillars.

These are neuroscience, medical imaging, cardiology, public health, materials of the future, environment, archaeology, laser optics and digital technologies.

These priorities reflect the research strengths of the Bordeaux site whose excellence is clearly recognised in terms of the standards applicable to the discipline and its high international profile.

Certifications by the French national "Investments for the Future" programme in 2011 have strengthened this dynamic of ambitious multidisciplinary projects. Today, these centres of excellence backed by innovative training offer great prospects for development, French research and the socio-economic world.

The pursuit of excellence is thus at the heart of the development policy of the University of Bordeaux. Through this tremendous momentum, the University of Bordeaux is seeking to answer the challenges of our environment to prepare for tomorrow's society.

« LAPHIA is building a unique centre of excellence, which is becoming recognised among the most prominent national and international laser and photonics research centres. »

*Lionel Canioni, director*

# LAPHIA

**Funded by the Excellence Initiative of the University of Bordeaux, LAPHIA (Laser and Photonics in Aquitaine) boosts research through collective site projects, drawing on the excellence of materials science and physics teams.**

LAPHIA unites the academic community in three main areas:

- Lasers and high energy physics
- Photonics and materials
- Innovative imaging

## Missions

→ **To federate the entire scientific community through interdisciplinary projects** in the field of lasers and photonics, and raise the international profile of Bordeaux research.

→ **To develop an area for collaborations** with the industrials, laboratories and international partners.

→ **To accelerate the process of technology transfer and the employability of its students** by strengthening ties with businesses.

→ **To provide students with a range of internationally-recognised training courses**, to enable them to become managers in photonics.

## → Key figures

- **250** researchers, engineers, PhD students and post-doc working on complementary themes
- **3** major research areas: photonics and materials, lasers and imaging
- More than **200 publications** a year
- **11** top-level research **laboratories**
- **20 start-up businesses and SMEs** (companies with less than 10 employees) created in 10 years, employing more than 260 people

## Gouvernance

**A steering committee:** Director: Lionel Canioni, Deputy Director - Education: Evelyne Fargin, Deputy Director - Research: Philippe Balcou, Deputy Director - Valorisation: Philippe Bouyer.

**A scientific council:** issues a scientific opinion on programme activities and projects and monitors these.

**A strategic council:** assesses strategy for research, training and development components, and provides expertise on current and future actions.

# Our community

*Collaboration is the key to innovation*

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## → Who is part of it?

### Academics

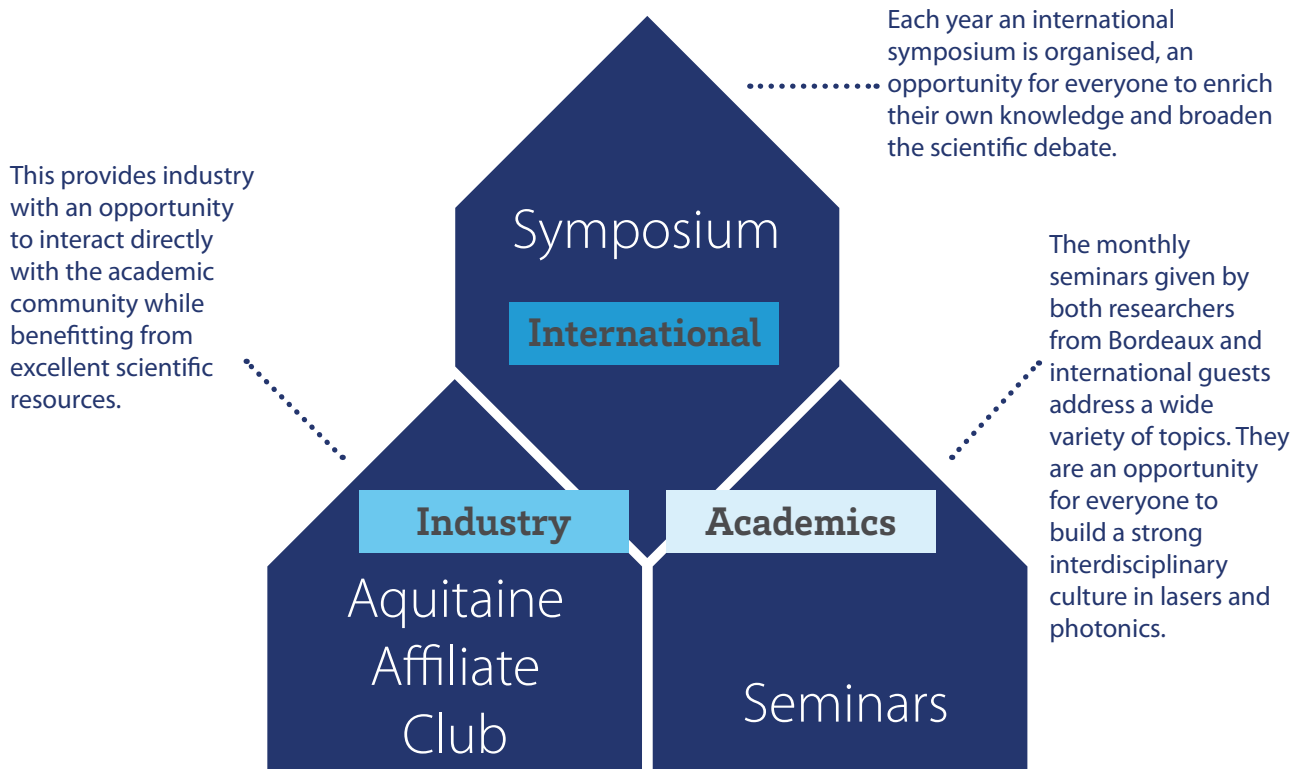
The academic hub comprises around 20 teams in 11 research laboratories. LAPHIA unites the community for better coordination of research efforts.

### Industry

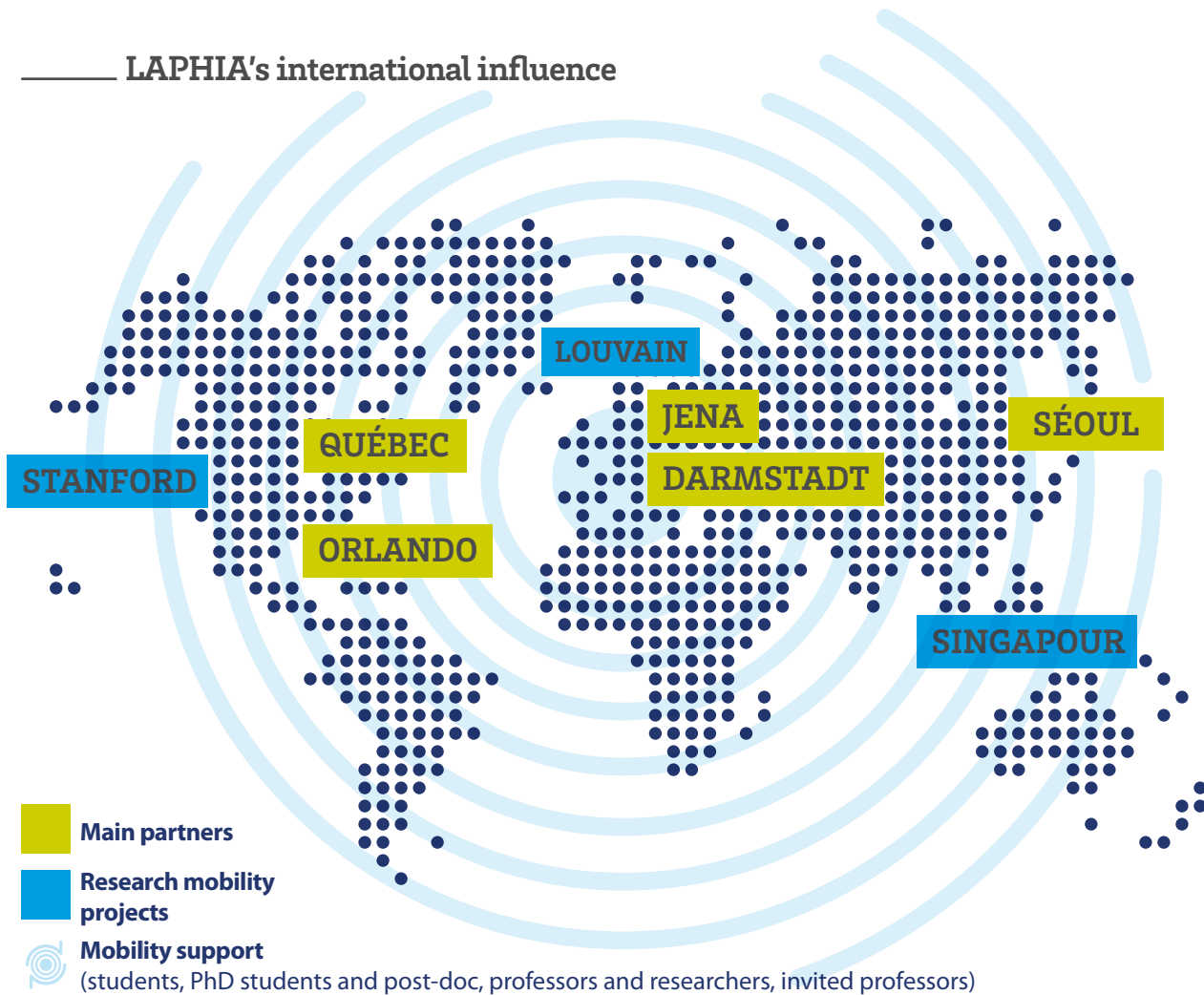
Companies can invest in our network through the Aquitaine Affiliate Club, hence achieving greater synergies between academic research and industry.

### International

LAPHIA is developing international cooperations, for example with Laval University in Quebec and Yonsei University in South Korea. LAPHIA is raising its profile by taking part in Photonics 21 networks (European Photonics Community) and SPIE (an international network in optics and photonics).



LAPHIA's international influence



Jean-Baptiste Trebbia, a researcher at the Laboratory for Photonics, Numerics and Nanosciences (LP2N).



LAPHIA seminars bring together students, professors, researchers and industrial partners associated with the laser and photonics scene. These seminars are a time for meetings and discussions, creating collaborative strength and raising the profile of our community. These seminars also help to effectively promote new scientific results.



# Cutting-edge research

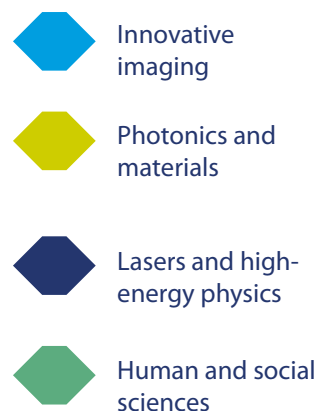
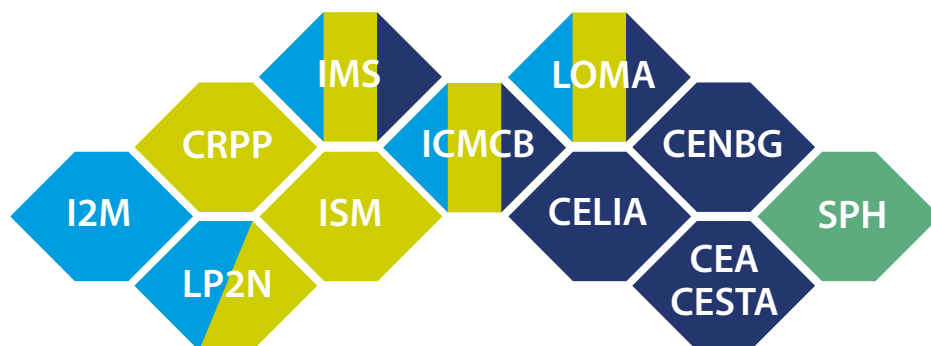
*Lasers and photonics, key technologies in the 21<sup>st</sup> century*

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## → What are the scientific challenges?

- Developing new laser and high-energy physics technologies
- Designing and developing tomorrow's photonic materials
- Working on imaging, a field in full development, covering both advanced microscopy and the use of new radiation.

## → Our laboratories



I2M: Institute of Mechanics and Engineering - CNRS (French public research body) / University of Bordeaux / IPB (Bordeaux Institute of Technology) / Arts et Métiers - Paristech.

CRPP: Paul Pascal Research Centre - CNRS

LP2N: Laboratory for Photonics, Numerics and Nanosciences - IOGS (Institute of Optics Graduate School) / CNRS / University of Bordeaux

IMS: Laboratory of Material and Systems Integration - CNRS / University of Bordeaux / IPB

ISM: Institute of Molecular Sciences - CNRS / University of Bordeaux

ICMCB: Institute for Solid State Chemistry of Bordeaux - CNRS

LOMA: Aquitaine Waves and Matter Laboratory - University of Bordeaux / CNRS

CELIA: Intense Lasers and Applications Centre - CNRS / CEA / University of Bordeaux

CENBG: Centre of Nuclear Studies of Bordeaux-Gradignan - CNRS / University of Bordeaux

CEA CESTA: French Alternative Energies and Atomic Energy Commission - Aquitaine Scientific and Technical Studies Centre

SPH: Sciences, Philosophy, Humanity - University of Bordeaux / Bordeaux Montaigne University

## → Our projects

**Collaborative:** the pillars of the LAPHIA programme, these projects are coordinated by teams from several laboratories on transdisciplinary topics.

**"Risky":** the aim is to encourage the emergence of scientific breakthroughs. The selected projects are risky but have a high potential return on investment.

**Mobility :** assistance for research projects with an international scope. These projects enable local research to receive wider recognition, while promoting knowledge transfer.



**Fabien Dorchies, CELIA researcher and coordinator of the XANES project**

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*The XANES time resolved project is a study that could only be undertaken with the use of these facilities at Stanford University (USA). The LAPHIA mobility project gave us the possibility to finance the fees related to the project for our teams so we could carry out experiments. This was a great chance for us to be reactive so that we could make this experiment a world first.*



**Petra Ivakovic, PhD student at CRPP/ISM // Vincent Rodriguez, researcher at the ISM and coordinator of the INPHOTARCH project // Mireille Blanchard-Desce, researcher at the ISM (from left to right)**

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INPHOTARCH LAPHIA brings together leading-edge skills in optics, lasers and materials chemistry. Initiated by LAPHIA, it brings together around 20 people from four laboratories. "On campus there were different areas of expertise within this field. LAPHIA allowed these areas to be combined, and new ideas to emerge", said Vincent Rodriguez. Pooling research efforts is an essential element of a policy of excellence. "The outcome of this project is not a sum of its parts, but a genuine synergy between the different skills involved," said Mireille Blanchard-Desce.



**Artur Aleksanyan, post-doc at LOMA // Etienne Brasselet, researcher at LOMA and coordinator of the MULTIVOR project (from left to right)**

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MULTIVOR uses defects in liquid crystal in devices used to observe exoplanets. "Without LAPHIA's risky project, my idea would not have been investigated so quickly. LAPHIA helped me find a full-time post-doctoral student to test my idea," said Etienne Brasselet.



# Excellence in training

*Education at the heart of our success*

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## → What are our aims?

The University of Bordeaux and schools are a breeding ground for future research. LAPHIA goes hand in hand with the actors of training in physics and chemistry at the University of Bordeaux, in order to extend the innovation effort of the laser and photonics sector. To open up training to an international audience, LAPHIA offers mobility opportunities to partner universities.

## → Opportunities offered by LAPHIA

Mobility



### **Inbound and outbound:**

This is supported through partnerships between LAPHIA and international universities for the joint supervision of theses and double Master's degrees.

Networks



Finding employment is facilitated by links which LAPHIA forges with industries. Students receive assistance for technology transfers, entrepreneurship and development.

Assistance



- Personalised support for students
- Sponsorship by industries
- Contact with student associations

Education



An optics-photonics-lasers training platform was created to structure and develop the Bordeaux training in that sector and to position it internationally.

### **Initial education:**

To help improve the experience of students on optics and materials courses, LAPHIA supports the development of a sector specialising in materials and photonics, by sharing resources with the satellite Institute of Optics Graduate School (IOGS) in Bordeaux.

### **Vocational education and training:**

LAPHIA has partnered with PYLA, the training centre for the Route des Lasers cluster.

### **Entrepreneurship training:**

LAPHIA has partnered with the Aquitaine Entrepreneurial Campus (ECA) in order to access educational, training and support tools for business start-up or take-over.



**Wendwesen Gebremichael, 2nd Year Master's Degree at the Friedrich–Alexander Universität (Germany), LAPHIA intern**

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*LAPHIA helped me financially and personally so that I could find the right contacts for my placement project at LOMA. I could focus on my research work, and not worry too much about practical issues of mobility. From the beginning I felt welcomed and supported, which motivated me to give my best.*



**Mathieu Chazot, 2nd Year Master's student on a Bordeaux/Laval (Quebec) University double degree programme**

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*I wanted to see how science was carried out beyond our borders. For me it was an opportunity to obtain an international diploma enabling me to meet researchers from around the world. LAPHIA helped me construct this project and avoid giving up when things got tough.*



**Guillaume Guery, glass fibre engineer at Saint-Gobain**

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*With my International Master's Degree in Lasers, Materials Science and Interactions (MILMI), I was able to find a job in a prestigious company. My Bordeaux/Central Florida (USA) University double doctoral degree, which was supported by LAPHIA, allowed me to have a better position to apply for jobs. Mobility during a period of study is useful as much for personal development as it is for providing an attractive profile for industries. This double degree is a definite plus on my CV.*



# Innovative companies

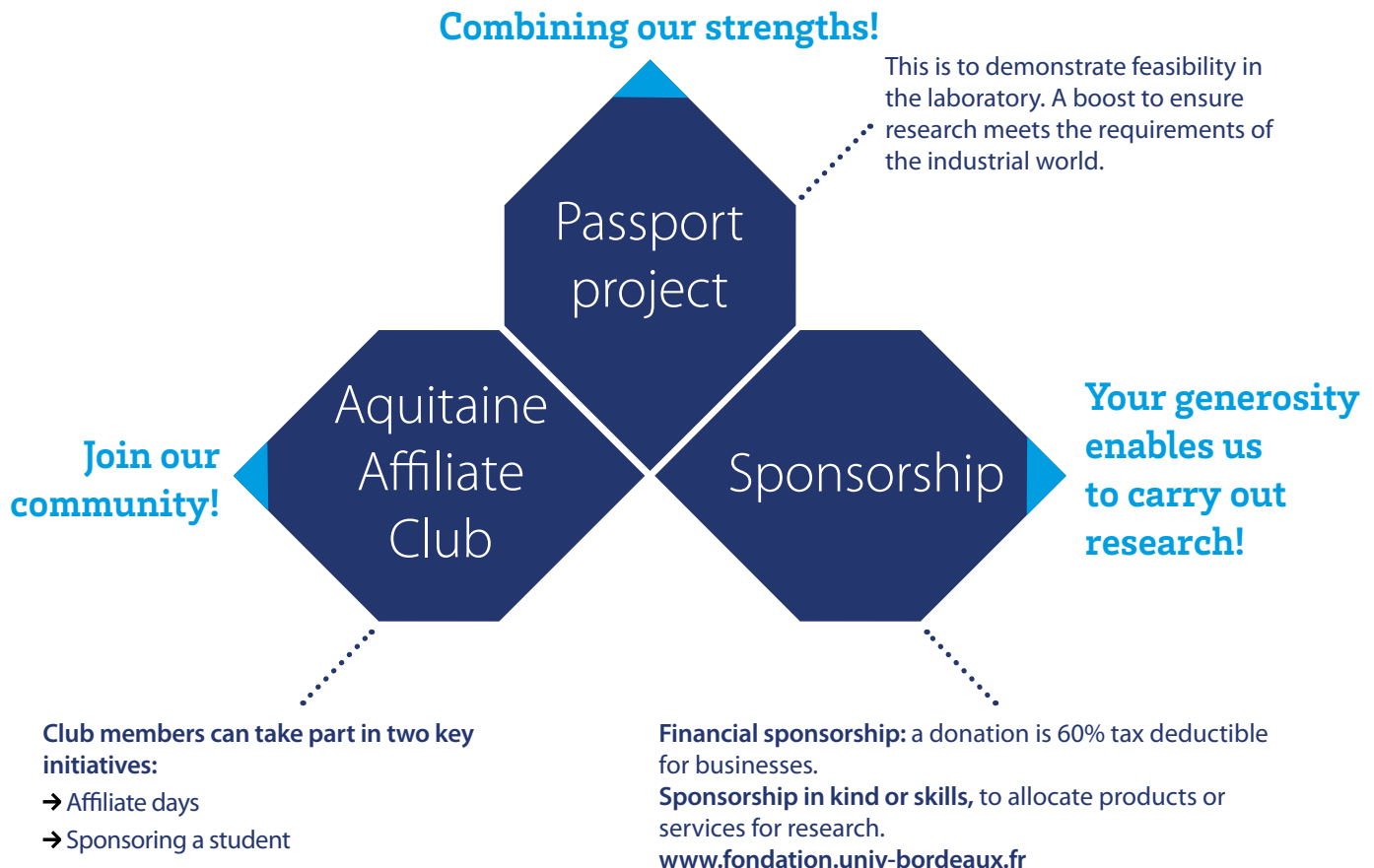
*A cutting-edge sector, creator of wealth*

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## → Research is preparation for tomorrow's markets.

LAPHIA provides the "fuel" for technology transfer, via research projects and development. LAPHIA supports projects with potential for technological breakthroughs. Progress in optics and photonics plays an important role in many sectors of our society: aerospace, energy, automotive, communications, health, medical, etc. The results of research supported by LAPHIA make technological innovation possible, as well as development of new products and/or business creation.

## → Get involved!



**Laurent Cognet, researcher at the Laboratory for Photonics, Numerics and Nanosciences (LP2N) and coordinator of the HiFretCancer project**

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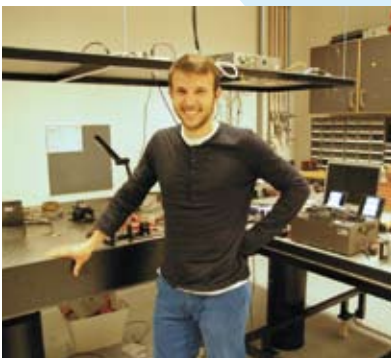


*HiFretCancer is a project that aims to develop a very high resolution optical imaging technique for use in oncology. The long-term goal is to improve diagnosis and choices of treatment for patients. With the funding of a one year post-doctoral salary granted by LAPHIA, we have been able to test our method with cancer markers. This project great potential for development results from closer ties with a biotechnology company. It is an example of the richness of collaboration which can be fostered between research and industry.*



**Romain Royon, PhD student at the Intense Laser and Applications Centre (CELIA), business creator**

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*My project is to produce and sell laser machines for medical applications and tattoo removal. Through LAPHIA, a laser and health centre has been developed in Aquitaine. Actors with a variety of complementary skills need to meet around a table to drive research forward. This momentum in research has allowed me to start from scratch and I have been able to create a start-up business.*





# LAPHIA

**Contact**

... [info.laphia@u-bordeaux.fr](mailto:info.laphia@u-bordeaux.fr)

**For more information**

[laphia.labex.u-bordeaux.fr](http://laphia.labex.u-bordeaux.fr)

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