



Electrophysiology and heart modeling institute

# THE LIRYC BEAT

NEWSLETTER N° 13 /// 2<sup>TH</sup> HALF 2021

EDITORIAL

## LIGHT UP YOUR HEART



by **Vincent Bitker**, fundraising director

**Preventing and healing cardiac rhythm disorders is the purpose of the “Light up your heart” campaign, officially launched by LiryC on September 29<sup>th</sup>, 2021.**

The five-year campaign aims to raise €10 million with businesses, foundations and donors from France and elsewhere in the world, and has currently reached 50% of its goal.

Why such a step? For reasons that go with the financial sustainability of the institute to the accomplishment of its purpose – saving lives. The generosity of donors enable LiryC teams to conduct scientific clinical, innovation and training programs of excellence to help roll back the prevalence of heart arrhythmia.

Thanks to the acquisition of major public funding from the “National Investment Program”, LiryC Institute was created 10 years ago, with a commitment to self-funding by 2025. To meet this challenge and respond to its public health ambition, LiryC is firmly committed to opening up through the launch of this major fundraising campaign, which should in time generates 25% of the institute’s business model.

Beyond the resources they represent that give hope to patients and their loved ones, donations are virtuous: they generate new encounters, raise awareness among populations and unite around the cause we carry. If generosity bonds people, it is a powerful impetus for LiryC researchers and doctors.

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## A FIBRE-OPTIC PROBE TO IMPROVE ACCESS TO VENTRICULAR FIBRILLATION ABLATION TREATMENTS

**Sudden cardiac death is responsible for 300,000 deaths every year in Europe, with ventricular fibrillation accounting for most cases. To date, only a minority of patients has access to targeted curative surgery, due to the difficult identification and detection of combined electrical, structural or biochemical substrates that are predisposed to ventricular fibrillation.**



Under the authority of researcher Richard Walton, Liryc's research teams combined with two European centres<sup>1</sup> in the Multifib consortium to develop and approve a new fibre-optic diagnostic probe that will enable high-resolution detection and tracking of the biochemical and structural heterogeneity in cardiac tissue.

A prototype was developed and then tested. For the first time, the probe integrates three different optical approaches, tomography by optical coherence, second-harmonic generation and Raman spectroscopy. It enables a resolution similar to that of a microscope to evaluate the properties of the cardiac muscle, identify cardiac fibrosis and to interpret the role of cardiac tissue and electrical signals in myocardial infarction.

The next steps will consist in refining the probe to file a patent and obtain clinical approval, with a view to marketing authorization.

This probe should considerably increase the eligibility of patients suffering from electrical heart diseases for curative surgery, while enabling the efficacy of ablation to be evaluated in real time.

1- Leibniz Institute of Photonic Technology and the Medical University of Vienna.

## HEART AND COVID-19 RESEARCH PROJECT: REASSURING INITIAL RESULTS

The ASCCOVID19 study, led at Liryc by Prof. Hubert Cochet, which looked into the consequences of Covid-19 on the heart of top-level athletes, has just finished. Out of 950 athletes included in the trial, among which 285 with a confirmed infection of Covid-19, no particular complication or anomaly linked to the Covid-19 infection was observed. These reassuring results, scientific publication of which is underway, will simplify the protocols prior to resuming competitive sport after a non-severe infection with Covid-19.

The Covid-CMR study, which evaluates the prevalence of silent myocardial scars using high-resolution MRI scans after Covid-19 infection, is ending its inclusion phase. The results, which will be published in early 2022, point to the same reassuring conclusions regarding the impact of Covid-19 on the heart.

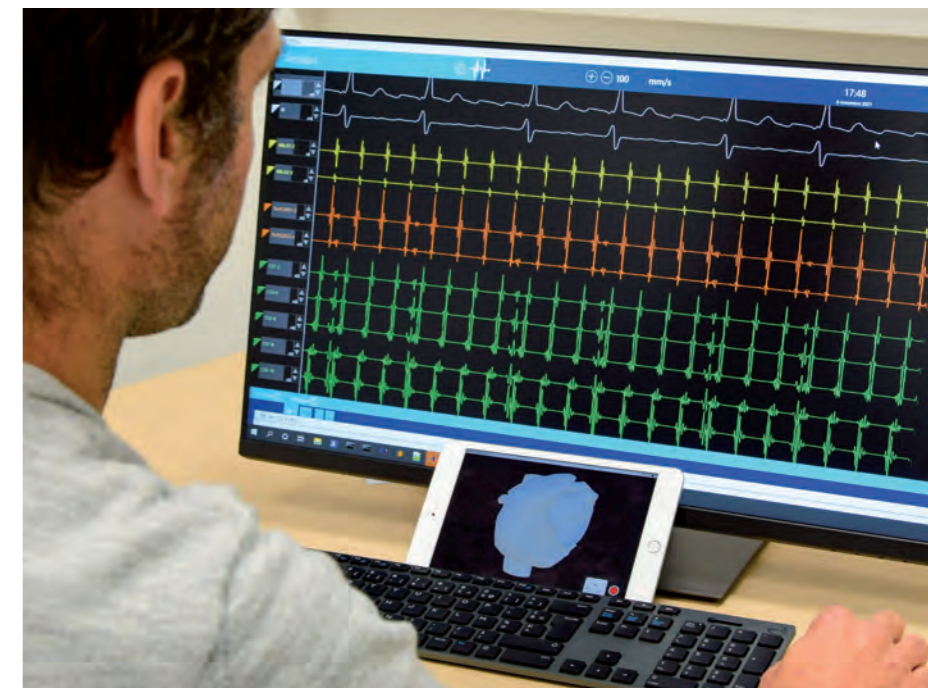


## PREVENTING SUDDEN DEATH WITH THE HELP OF A SMARTWATCH: PROMISING INITIAL RESULTS



Prof. Pierre Bordachar, Dr. Marc Strik and their teams have assessed the feasibility of using ECG traces, recorded by a smartwatch, for the detection of abnormalities associated with an increased risk of sudden cardiac death in young adults. They compared the trace recorded with a watch and a traditional 12-lead trace in 155 healthy volunteers and 67 patients aged 18 to 45 years with a heart condition at risk of sudden death<sup>2</sup>. The preliminary results observed are promising and the quality of the tracings are satisfactory, enabling a certain number of diagnoses that could favour early management.

2- Arrhythmogenic right ventricular dysplasia/ cardiomyopathy, Brugada syndrome, Long QT syndrome, Ventricular pre-excitation.



## NEW REALISTIC LEARNING SOFTWARE TO ENHANCE PRACTITIONER TRAINING

A great deal of technical expertise beyond the specialty of cardiology, requiring training and repetition of gestures for practitioners. To have a training tool ever more in line with training needs and accessible to a greater number of people, Dr. Josselin Duchateau and Prof. Rémi Dubois, Director of the innovation department, have developed learning software called SIMplex, with the help of the HILO company for the graphic interface.

The software, which enables the generation of electrical signals in real time, is not only integrated into the SIMRIC simulator<sup>3</sup> but is also available in simpler form on a computer. In practical terms, it enables the experimenter to see the effect of their gesture on the morphology of displayed signals. The catheter ablation procedure involves identifying the heart tissues to target and understanding the underlying pathology by performing manipulations, such as stimulation.

Today, the application of the stimulation is reflected in the simulator by a real-time calculation of the signals dependent on the characteristics of the tissues, inspired by clinical data and scientific literature. In addition to the technological innovation represented by these calculations, they constitute a real advance in the realism of the simulator.

New clinical cases will enrich the software in the future. In the meantime, the first practical application will happen in the coming weeks with students in the first edition of the master's in electrophysiology, who joined Liryc at the start of the school year.

3- SIMRIC – Intra-Cardiac Catheters Training Simulator for Treatment of Arrhythmias, developed by the innovation teams, which manipulated electrophysiological catheters on a dummy in a realistic setting.

### → HIGHLIGHTS

## NEW IMAGING TECHNOLOGY FOR A SAFER, QUICKER AND MORE PRECISE DIAGNOSIS IN CARDIOLOGY

**Backed by maths, physics and computer science tools, researchers at Liryc have developed new technology enabling colour magnetic resonance images (MRI) of the heart to be collected.**

This new form of "dark blood imaging" simplifies the visualization of scars caused on the heart muscle by infarction, collecting only the signal of abnormal cardiac tissue, all within two minutes in the machine. This work carried out by Dr. Aurélien Bustin, a researcher at Liryc, is part of the scientific chair of excellence led by Prof. Matthias Stuber of Lausanne University Hospital. In just a few months, nearly 300 MRI images of the heart have been collected using this technique at Bordeaux University Hospital. Today, these advances open new perspectives in obtaining quicker, safer, and more precise clinical diagnosis, but also new therapeutic opportunities, notably in guiding ablations.



# THE QUALITY OF LIFE OF PATIENTS IN PAEDIATRIC CARDIOLOGY: A MAJOR ISSUE

**Dr. Pascal Amédro, doctor and researcher specializing in heart defects in children and adults, has just joined the team of Prof. Thambo at the M3C National Reference Centre in Bordeaux University Hospital. Driven since the beginning of his career by a aspiration to improve the quality of life in paediatric and congenital cardiology, he has developed several research programs on this topic.**



**What programs are you carrying out on this line of research?**  
We have conducted several quality of life studies in children or adults with congenital heart disease and identified two determinants of quality of life: aerobic physical fitness (VO2 max) and mental health. We created the Qualirehab research program, which uses cardiovascular rehabilitation in the centre and at home. We then extended this program to other rare heart diseases, genetic cardiomyopathies and inherited rhythmic diseases in the Qualimyorythm trial.

**What projects are planned at Bordeaux University Hospital and Liryç?**

Chronic diseases in children represent an increased cardiovascular risk in adulthood, through the physical deconditioning associated with the disease and sedentary behaviours. With early and "holistic" care, we will deploy our program in other chronic pathologies, such as in young people in remission from paediatric cancer. Finally, since mental health is a major determinant of the quality of life of children who have had heart surgery, the Qualineuro-Rehab study will combine neurocognitive rehabilitation with cardiovascular rehabilitation.



**What are we talking about in terms of improving the quality of life in paediatric and congenital cardiology?**

In 20 years, remarkable progress has been made in the treatment of heart defects. Today, more than 9 in 10 children reach adulthood; it is more about "living with" rather than "surviving with" congenital heart disease. However, the impact of heart disease on quality of life has long remained a subject that has been little explored in research. During prenatal diagnosis, parents often ask what the quality of their child's life will be.

## HEALTHCARE TEAMS WIN AWARD



The excellence of the electrophysiology and cardiac stimulation teams at Bordeaux University Hospital in the care of patients with cardiac arrhythmias was proven once again in 2021, when they maintained their first place among 348 establishments in France in the 2021 Hospitals and Clinics Awards of the magazine Le Point.

### → A LOOK BACK AT

## IMPROVING THE CARE OF VASOVAGAL SYNCOPE

Vasovagal syncope is linked to excessive activity of the parasympathetic nervous system, which causes blood pressure to drop rapidly and the heart rate to slow, followed by transient loss of consciousness. Most of the time, these episodes are isolated and mild, but in some patients these losses of consciousness can be frequent and debilitating, justifying treatment.

Faced with the limitations of insertion of a pacemaker, cardioneuroablation can suppress this vagal reflex, using catheter ablation. For this, the ganglionated plexi,



located in the immediate vicinity of the left and right atria are targeted. The difficulty of this technique lies in finding their precise location. Liryç's teams, under the leadership of Dr. Josselin Duchateau, use the CT scan to identify the target area upstream with excellent results, both in terms of procedure simplification and intervention success. Cardioneuroablation should be the subject of a future research program to consolidate these initial results.



# LAUNCH OF THE INTERNATIONAL MASTER'S IN "CARDIAC EP ELECTROMECHANICAL HEART DISEASES"



**Monday October 4<sup>th</sup>, 2021 was the start day for students of the international master's in "Cardiac EP Electromechanical Heart Diseases"<sup>4</sup>. This master's program, which is part of the Graduate School for Young Researchers of the University of Bordeaux, emphasizes the link between research and training.**

The "Cardiac EP Electromechanical Heart Diseases" master's program provides training focused on research and innovation for high-level specialists in the field of electrophysiology and cardiac bio-engineering. Its strength is its multidisciplinary and highly translational teaching program, reflecting the structure of research activity at Liryç.

The teaching team has consolidated an innovative teaching approach, combining theory and practice with teaching through transversal projects according to the following themes:

- Function, energetics and electrophysiology of the heart
- Physiopathological and pathological aspects of electromechanical heart disease

- Biomedical engineering: cardiac signals, imaging and devices
- Therapeutics and devices for the treatment of electromechanical heart diseases
- Economic knowledge and innovation-strategic watch and competitive intelligence.

The master's program opens up a research and training environment for students, who met world-renowned experts and international university and industrial partners, thereby expanding their network with a view to their imminent entry into the labour market or the pursuit of their studies.

<sup>4</sup> Electrophysiology of the heart - Electromechanical heart diseases

**"** *What I find most enjoyable about the program so far is the diversity in classes. Also, the level of the teachers is extremely high. I feel like I am being taught by the best in the electromechanical cardiology field.* **"**

**Joske van der Zande,**  
Master student (Netherlands)

## ACCELERATE THE DIGITAL TRANSITION OF EDUCATIONAL TOOLS

To meet the intensification of local, national and international training needs, Liryç's teaching staff are enhancing their digital strategy. Their aim is to make training in innovative care techniques and tools more accessible and free to as many centres as possible around the world.



For this, a training program based on the online training site [www.liryç-education.fr](http://www.liryç-education.fr), which offers unlimited personalized transversal content, is in the making. It will feature immersive experiences with catheterization simulators, digital books, live sessions from international experts and hands-on training, in conjunction with our industrial partners.

## ALLIANCE PROGRAM CONFERENCE: A HYBRID FORMAT AT THE HEART OF INNOVATION

On September 29<sup>th</sup> and 30<sup>th</sup>, 2021, Liryç co-organized the Alliance Program conference in its premises with the world leader Boston Scientific; an unmissable event for electrophysiology professionals. The hybrid event brought together around forty experts on site and more than 300 remote professionals. There was an innovation area to discuss and discover new techniques (electroporation, high-resolution imaging and mapping, cryo-ablation, etc.) and numerous live cases broadcast from operating rooms, to interact with internationally renowned experts on the various innovative treatment options for atrial and ventricular fibrillation.



## €10 MILLION TO STEP UP PREVENTION OF CARDIAC RHYTHM DISORDERS AND REVOLUTIONIZE THEIR TREATMENT

On September 29th, 2021, on the World Heart Day, Liryc launched its fundraising campaign "Light up your heart" on an exceptional evening at Bernard Magrez's Château Pape Clément. This event brought together Liryc's community of donors to celebrate and thank the first major supports of the institute. The campaign has already reached more than 50% of the €10 million target to reduce heart rhythm diseases, with the generosity and remarkable mobilization of everyone involved.

Commitment was the key word of this evening, during which the guests benefited

from a virtual reality experience in a heart, proposed by Dr. Clémentine André and Aurélien Bustin, a talk with a young patient, led by Dr. Mélèze Hocini and one of our major donor Jean-Paul Calès, a testimonial from our ambassador Jean Galfione, as well as a presentation of a therapeutic revolution by Prof. Pierre Jaïs.

*"We're writing the finest pages of rhythmology together, I'm sure that the best is yet to come. Thank you to all for your support."*

**Prof. Pierre Jaïs**,  
Liryc's General Director.

### → A LOOK BACK AT

## LIRYC HAS THE WIND IN ITS SAILS

On Saturday September 11<sup>th</sup>, 2021, the new Class 40 Serenis Consulting, a boat of Liryc's ambassador, Jean Galfione, was baptized in front of the ramparts of the corsair city in Saint Malo, Brittany.



research to reduce heart rhythm diseases that affect millions of people around the world.

*"The sailboat is in Liryc's colours, which gives even more value to my project and beauty to my aims. It's a huge cause that we don't talk about much!"*

**Jean Galfione**



## PORTRAIT NARIMANE GASSA



### Portrait of a PhD student in modeling: Narimane Gasa

**Narimane, what is your position at Liryc?**  
I am a PhD student at the University of Bordeaux, attached to the CARMEN team at the French National Institute for Research in Computer Science and Control (INRIA) and to Liryc in the modeling team since September 2020, when I started my science thesis in mathematics applied to cardiology.

**What does your job entail at Liryc?**  
My research focuses on the development of alternative mathematical models to describe the electrical activity of the heart, with a more simplified approach. Their simplification and reduced calculation time will enable application to be made to real clinical cases. All the modeling work consists of understanding what is happening in the heart, with the idea of having a clinically applicable end result, a benefit for the care of patients.

We are also working on solving what are called inverse problems in electrocardiography. Cardiac mechanisms are reconstructed from non-invasive data taken from the surface of the torso.

**What are you most proud about?**  
What I'm most proud about, or rather my plan for the future, would be to help our current research directly serve to improve the quality of life of patients. I am passionate about mathematics and have always dreamed of applying it in medicine so that I can make a difference in the care and lives of patients!

**Last question, what was your favourite subject at school when you were little?**  
It was mathematics! I've loved mental arithmetic since I was very little.

## TRIBUTE

All of Liryc's healthcare, research and administrative teams would like to express their sadness for the sudden death of their friend and colleague Xavier Pillois.



Xavier was Data Manager, statistician and methodologist in cardiac electrophysiology.

Holder of an authorization to supervise research in biological and medical sciences, self-taught in computer science, he joined the Bordeaux University Hospital 20 years ago, before being attached to the Liryc teams in 2014 supporting medical research.

With a lively, free and very creative mind, and a great scientific culture, Xavier attached lot of importance to exchanging and sharing his knowledge with colleagues, as well as discussing the search for new solutions. Through his investment and expertise, he contributed a lot to the institute's clinical research projects.

We send our deepest condolences and our kindest thoughts to his loved ones.

## A NEW MAJOR DONOR FOR LIRYC

Biosense Webster, of the Johnson & Johnson group, has signed a multi-year donation agreement for Liryc to support the work of the scientific chair of excellence in the prevention of sudden cardiac death.

Liryc and Biosense Webster have been in a scientific partnership for more than 20 years, with the common goal of innovating in the treatment of heart arrhythmias. Biosense Webster is a world leader in the science of diagnosing and treating cardiac arrhythmias, renewing its confidence in Liryc by joining the community of donors of the institute.



*"We are proud to support the research and commitment of doctors and scientists at Liryc University Hospital Institute. We share with Prof. Pierre Jaïs and his team the same fight: to work tirelessly for better care of patients with heart rhythm diseases, thanks to innovative medical solutions."*

**Christophe Duhayer**,  
Managing Director, Johnson & Johnson Medical Devices – France



# A LOOK BACK AT THE KEY EVENTS

→ 06-12-2021

The **Reference Centre for Hereditary Rhythmic Diseases** organized, in hybrid format, a second day of discussions and sharing at Liryc between patients, families, paramedics and doctors to discuss about of diagnoses, treatments, pathologies and daily life.



3D experience allowing people to travel through the heart.

→ 07.28-31.2021

Liryc researchers and doctors have contributed to the virtual edition of the **Heart Rhythm Society's international benchmark congress**, discussing with their peers from around the world on the latest research in the prevention and treatment of heart rhythm diseases.

→ 09.24.2021

Teams from Liryc took part in the **European Researchers' Night at Cap Science** to talk to the general public about heart rhythm diseases through workshops, demonstrations and a virtual

→ 10.08.2021

Liryc welcomed the **European scientific project Microcard's teams**, led by Mark Potse, researcher at the Liryc Institute, to promote exchanges and establish lasting work dynamics between multidisciplinary experts.



→ 10.11.2021

**Onsite start of the third class of students** from the university degree in remote monitoring of implantable cardiac devices. Practical and theoretical program to train paramedical professionals in the operation and monitoring of implantable cardiac devices.

→ 10.16.2021

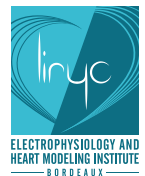
Liryc took part in the international awareness day for cardiac arrest, Place Pey-Berland in Bordeaux alongside the association "Choquez-Nous" and the French Federation of Cardiology to explain what is happening in the heart in the case of cardiac arrest.



## WE CAN SUPPORT LIRYC TOGETHER TO PREVENT AND CURE HEART RHYTHM DISEASES

Make a donation on: [www.ihu-liryc.com](http://www.ihu-liryc.com)

or by bank check: **IHU Liryc - FBU**  
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## "THE LIRYC BEAT"

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