



HIFU*ture*

21 April 2023

Let's imagine today the ultrasound treatments of tomorrow!

PROGRAM

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Dear Colleagues,

We are very pleased to invite you to Lyon for the [2nd HIFUture Symposium](#) which will take place on **Friday, April 21, 2023**, following the [ISTU/EUFUS 2023 International Symposium](#). This event will bring together, in the beautiful environment of the Palais de la Bourse, **clinicians, researchers, engineers and industrials** involved in ultrasound treatments in France and abroad. The symposium program will include **presentations by clinical and academic leaders** :

- On a prospective of therapeutic ultrasound with a special focus on the future of HIFU in Interventional Radiology
- On ultrasound physics and the most emblematic clinical applications in various specialties: Neurology, Gynecology, Musculoskeletal and Abdominal
- On the latest clinical innovations in therapeutic ultrasound and those to come soon in various medical specialties: Interventional Radiology, Neurology, Digestive Surgery, Gynecology, Obstetrics and Cardiology

We are pleased to unveil the detailed [program of HIFUture 2023](#) in this program book.

The event will be held in person. The presentations can also be followed remotely thanks to their retransmission in virtual conference. This day is open to the entire clinical, scientific and industrial community.

After the success of the 1st edition in 2021, we are forward to seeing you on **April 21, 2023** for this 2nd edition, to write together a HIFUture.

The organizers of HIFUture

Friday, April 21

08H00 – 17H15

- 08h00-09h00** **Breakfast Lecture** : “*Interventional HIFUTURE*” - [Pr. Laurent Milot](#) (HCL – Interventional Radiology / LabTAU, INSERM, Univ Lyon, France) (**Corbeille et Ampère**)
Chair: [Chrit Moonen](#) (University Medical Center Utrecht, Utrecht, The Netherlands)
- Welcome** : [Pr. Gil Dubernard](#) (HCL – Gynecology / LabTAU, INSERM, Univ Lyon, France) and [Dr. Cyril Lafon](#) (LabTAU, INSERM, Univ Lyon, France) (**Ampère**)
- 09h00-09h30** **Scientific Background** : “*Physical principles involved in focused ultrasound treatments*” – [Dr. Maxime Lafond](#) (LabTAU, INSERM, Univ Lyon, France) (**Ampère**)
Chair: [Jonathan Vappou](#) (ICube, CNRS/University of Strasbourg, France)
- 09h30-10h00** **Coffee Break / Exhibits (Corbeille)**
- 10h00-11h40** **Clinical Reviews** : Neurology, Gynecology, Musculoskeletal, Abdomen (**Ampère**)
Chair: [Aurélien Dupré](#) (CLB, Univ Lyon, France / LabTAU, INSERM, Univ Lyon, France)
- 10h00-10h25** **Neurology** : “*HIFU in Neurology*” - [Dr. Nadya Pyatigorskaya](#) (APHP – Neuroradiology / Brain Institute – ICM, Paris, France)
- 10h25-10h50** **Gynecology**: “*HIFU in obstetric gynecology*” - [Dr. Benoit de la Fournière](#) (HCL / LabTAU, INSERM, Univ Lyon, France)
- 10h50-11h15** **Musculoskeletal** : “*MRgFUS treatment of musculoskeletal tumors*” - [Dr. Fabrice Bing](#) (Hôpital d'Annecy, Metz-Tessy / Icube, CNRS, Université et IHU Strasbourg, France)
- 11h15-11h40** **Abdomen**: “*Hepato-biliary and pancreatic applications*” - [Dr. Romain L'Huillier](#) (HCL – Interventional Radiology / LabTAU, INSERM, Univ Lyon, France)

- 11h40–12h00 Exhibits (Corbeille)
- 12h00–13h00 Lunch / Exhibits (Corbeille)
- 13h00–15h00 **Clinical Innovations (Part 1)** – Neurology , Digestive Surgery, Gynecology (**Ampère**)
Chair: [Feng Wu](#) (University of Oxford, United Kingdom)
- 13h00-13h30 **Neurology :** “*Transdural Blood Brain Barrier (BBB) Opening*” - [Pr. Alexandre Carpentier](#) (APHP - Neuro chirurgie, Paris, France)
- 13h30-14h00 **Neurology:** “*Transcranial Blood Brain Barrier (BBB) Opening*” - [Pr. Nir Lipsman](#) (SRI, Sunnybrook Health Sciences Center, University of Toronto, Canada)
- 14h00-14h30 **Digestive Surgery :** “*Histotripsy in the liver*” - [Pr. Joan Vidal-Jové](#) (Institute Khuab for Interventional Oncology, Barcelona, Spain),
- 14h30-15h00 **Gynecology:** “*Endometrioses*” - [Dr. Charles-André Philip](#) (HCL – Gynecology / LabTAU, INSERM, Univ Lyon, France)
- 15h00-15h30 **Coffee Break / Exhibits (Corbeille)**
- 15h30–17h00 **Clinical Innovations (Part 2)** – Obstetrics, Cardiology, Interventional Radiology (**Ampère**)
Chair: [Emily White](#) (Focused Ultrasound Foundation, Charlottesville, United States)
- 15h30-16h00 **Obstetrics:** “*Twin-to-twin transfusion syndrome (TTTS)*” - [Pr. Christoph Lees](#) (Imperial College London, United Kingdom)
- 16h00-16h30 **Cardiology:** “*Calcified aortic valve stenosis*” [Pr. Emmanuel Messas](#) (Hôpital Européen Georges Pompidou, Université Paris Descartes, France)
- 16h30-17h00 **Interventional Radiology:** “*Musculoskeletal (MSK) tumours*” - [Pr. Afshin Gangi](#) (Hôpital de Strasbourg, Strasbourg, France), *Bone and muscle tumors*
- 17h00-17h15 **Conclusions** – [Pr. Gil Dubernard](#) (HCL – Gynecology / LabTAU, INSERM, Univ Lyon, France) and [Dr. Cyril Lafon](#) (LabTAU, INSERM, Univ Lyon, France) (**Ampère**)

08h00 - 08h55 BREAKFAST LECTURE – “INTERVENTIONAL HIFUTURE”

Chairman - [Chrit Moonen](#) ¹

¹ University Medical Center Utrecht, Utrecht, The Netherlands

Speaker - [Laurent Milot](#) ^{1,2}

¹ Department of Radiology, Hospices Civils de Lyon, Lyon, France

² LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

Image Guided Therapy (IGT) is a fast growing domain, transforming today's medicine. In this early morning lecture, we will cover some exciting new developments in the field of Interventional Radiology, such as Robot guided procedures, biology based multimodal treatments (angiography + ablations), “It couldn't be done but was done” procedures (balloon based intervention,...) and discuss where we could be going! We will of course FOCUS on how and why HIFU may be the way of the future, potentially becoming the limitless modality we believe it can and will be!

08h55 - 09h00 WELCOME

[Gil Dubernard](#)^{1,2} and **[Cyril Lafon](#)** ²

¹ Gynecology Department, Croix-Rousse University Hospital, Hospices Civils de Lyon, Lyon, France.

² LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

09h00 - 09h30 PHYSICAL PRINCIPLES INVOLVED IN FOCUSED ULTRASOUND TREATMENTS

Chairman - [Jonathan Vappou](#)¹

¹ ICube laboratory, CNRS/University of Strasbourg, Strasbourg, France

Speaker - [Maxime Lafond](#)¹

¹LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

Focused ultrasound is rapidly emerging as a versatile therapeutic tool, with applications ranging from cancer therapy to drug delivery. This presentation aims to equip clinicians with a foundational understanding of the key principles behind focused ultrasound technology. Beginning with the basics of ultrasound wave propagation, including wavelength and frequency, the presentation will delve into the physics of dynamic focusing. The second part of the presentation will explore the principles underlying the bioeffects that clinicians seek to elicit through focused ultrasound, which can be broadly categorized as thermal and mechanical effects. Attendees will gain a deeper understanding of the physical principles governing focused ultrasound, empowering them to better understand and utilize this technology in their clinical practice.

09h30 - 10h00 COFFEE BREAK / EXHIBITS

Chairman - [Aurélien Dupré](#)^{1,2}

¹Service de chirurgie oncologique, Centre Leon Berard, Université Lyon 1, Lyon, France.

²LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

10h00 - 10h25 NEUROLOGY

Speaker - [Nadya Pyatigorskaya](#)^{1,2}

¹APHP – Neuroradiology

²Brain Institute – ICM, Paris, France

HIFU in Neurology

High Intensity Focused Ultrasound (HIFU) is an emerging mini-invasive treatment modality that has shown promise in the treatment of various neurological disorders. This precise targeting allows for the treatment of various neurological disorders, such as essential tremors, Parkinson's disease, and neuropathic pain. Essential tremors are a common neurological disorder characterized by involuntary shaking of the limbs. HIFU has shown significant improvements in reducing tremors, providing a non-invasive alternative to traditional treatments, such as deep brain stimulation. Parkinson's disease is another neurological disorder that has shown promising results with HIFU treatment. HIFU has been shown to alleviate tremors and other motor symptoms associated with Parkinson's disease. HIFU has also shown potential in the treatment of neuropathic pain, providing significant pain relief in patients suffering from neuropathic pain, improving their quality of life and reducing the need for opioid medication. Other applications are under investigation including psychiatric disorders, epilepsy or blood brain barrier opening. Focused ultrasound can be used not only for lesion creation but also for neuromodulation. Neuromodulation is a technique that allows for the modulation of brain activity without causing any permanent lesion or heating the brain. This method can be promising in treating psychiatric disorders as well as movement disorders and other pathologies. In summary, HIFU is an emerging treatment modality that has shown promise in the treatment of various neurological disorders. Its non-invasive nature and precise targeting make it a viable alternative to traditional treatments, offering patients improved outcomes and reduced risks associated with invasive surgeries. Further research and clinical trials are needed to fully understand the potential of HIFU in the treatment of neurological disorders, but the current results are promising.

10h25 - 10h50 GYNECOLOGY

Speaker - [Benoit de la Fournière](#)^{1,2}

¹HCL

¹LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

Current and future role of HIFU in obstetric gynaecology

Obstetric gynaecology, as a field in which diagnostic ultrasound has quickly found its place, especially in screening for birth defects and monitoring pregnancies, is also a specialty in which therapeutic ultrasound is used extensively. In obstetrics, HIFU could become a treatment of choice for vascular anomalies such as twin-to-twin transfusion syndrome in twin pregnancies. Promising studies are also available regarding the use of HIFU in the treatment of post-partum placenta accreta. In senology, where visible scars have a particularly significant psychological impact, several teams have been researching the use of HIFU for the destruction of some types of breast lesions (fibroadenomas and breast tumours). In pelvic gynaecology, HIFU therapy is used more specifically in two types of uterine conditions: fibroids and adenomyosis. In both cases, studies have shown significant efficacy in reducing pain and bleeding associated with the conditions, secondarily (more moderately but still significantly) reducing the volume of the lesions. Impact on fertility has yet to be demonstrated. In rectosigmoid endometriosis, clinical data indicates good treatment feasibility and significant efficacy on digestive and gynaecologic pain symptoms, as well as on quality of life, with no associated severe complications. Should the efficacy of HIFU in treating endometriosis be confirmed over time, it could revolutionise the management of digestive endometriosis by offering a valid minimally invasive alternative to rectosigmoid surgery.

10h50 - 11h15 MUSCULOSKELETAL

Speaker - [Fabrice Bing](#)^{1,2}

¹ Department of Radiology, Hôpital d'Annecy, 1 avenue de l'Hôpital 74374 Metz-Tessy, France

² Icube Laboratory, Université de Strasbourg, CNRS, IHU Strasbourg, ICUBE, 1 place de l'hôpital, 67091, Strasbourg, France

MRgFUS treatment of musculoskeletal tumors

Safety and efficiency of Magnetic resonance-guided focused ultrasound (MRgFUS) therapy in bone have been reported in animal and clinical studies. Osteoid osteomas

(OOs) and metastases are the main bone lesions treated. Case series on primitive malignant bone and soft tissues tumors MRgFUS ablation have also been published. The intended therapeutic effect is curative for OOs and can be either palliative and/or curative for metastases. The success of the treatment depends on the ability to heat the entire lesion sufficiently in the case of curative treatments. In case of OO, pain relief is supposed to be secondary to the interruption of the production of inflammatory mediators released by the nidus and stimulate nociceptors. In case of painful bone metastases, the primary goal is pain relief: for that, mechanisms are periosteum denervation, tumor debulking, reduction of inflammatory mediators' release and the degree of osteoclast-mediated osteolysis. Tumor control is attempted in patients with oligometastatic disease and with a life expectancy longer than 12 months. A multidisciplinary team discussion is mandatory to assess the suitability and feasibility of a minimally thermal ablative approach, to select the most appropriate technique (radiofrequency, laser, microwave, cryotherapy or MRgFUS) and to set the goals of treatment. MRgFUS presents the advantage to be a non-invasive and non-ionizing therapy. MRgFUS may show faster effect than radiotherapy and can be repeated without any limit. Limitations are the acoustic barriers on the US pathway and the collateral thermal effects on adjacent structures, limiting its application to extra-axial lesions. Moreover, the need of biopsy before and consolidation after the treatment may limit the interest of MRgFUS. The interaction between ultrasound and biological tissues is complex. Depending on ultrasonic frequency, intensity and pulse repetition frequency, different physical phenomena can be achieved, such as cavitation or thermal effects related to the absorption of the acoustic energy. In all cases, a successful treatment involves control of the deposited heat, which requires not only proper monitoring in real time, but also proper understanding of the underlying physical phenomena, from applied MRgFUS power and focusing strategy to tissues' thermal diffusion properties. Substantial disparities can be found among reported studies in terms of physical and experimental parameters used. In several clinical studies, important information such as focusing, MRgFUS power, time and number of MRgFUS shots are missing. The purpose of this review is to present the recently published literature regarding MRgFUS procedures in the treatment of patients with musculoskeletal tumors, focusing on thermal effects, indications, clinical results and technical considerations, in comparison to other medical treatments and minimally invasive thermal therapies.

11h15 - 11h40 ABDOMEN:

Speaker - [Romain L'Huillier](#)¹

¹ Department of Radiology, Hospices Civils de Lyon, Lyon, France

² LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

US therapies in clinical practice – Hepato-biliary and pancreatic applications

The liver and pancreas are organs that are particularly studied and evaluated in ultrasound therapies. Clinical applications of US therapies are largely focused on hepatic tumors (primary or secondary malignancies) and pancreatic cancer. The extracorporeal approach, which is the most used, is challenging because of the interposition of the rib cage and respiratory movements for the liver and because of the very deeply located nature and the risk of gas interposition for the pancreas. The most commonly used modalities for guiding and monitoring the treatment are Magnetic Resonance Imaging (MRI) and Ultrasound. The vast majority of available clinical devices use the thermal effect of tissue destruction by High Intensity Focused Ultrasound (HIFU). However, more and more space is given to thermal effects without tissue destruction and to mechanical effects.

Lunch / Exhibits

11h40-13h00 (Corbeille)

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11h40 - 12h00 EXHIBITS



12h00 - 13h00 LUNCH / EXHIBITS



Chairman (Part 1) - [Feng Wu](#)¹

¹Nuffield Department of Surgical Sciences, University of Oxford, United Kingdom

13h00 - 13h30 NEUROLOGY

Speaker - [Alexandre Carpentier](#)^{1,2,3}

¹APHP, Department of Neurosurgery, Sorbonne University, La Pitié-Salpêtrière Hospital, Paris, France

²Paris Brain Institute, INSERM, CNRS, Sorbonne University, UMR S 1127, Paris Brain Institute, ICM, F-75013 Paris, France

³CarThéra, Brain and Spine Institute, Pitié Salpêtrière Hospital, 47-83 Boulevard de l'Hôpital, 75013 Paris, France.

Transdural Blood Brain Barrier (BBB) Opening

The management of brain tumors is surgical, followed in case of malignancy by radiotherapy with concomitant chemotherapy with temozolomide, and by 6 monthly sessions of adjuvant temozolomide (Stupp et al. 2005 protocol). Despite this treatment, the median recurrence is 7 months, with a median survival of 15 months. The failure of this current standard treatment is due not only to incomplete surgical resection of these tumors because they are infiltrating, but also to poor penetration of chemotherapies into the infiltrated brain parenchyma (Hochberg et al. 1980; Wallner et al. 1989) due to the presence of the blood-brain barrier (BBB) (Abbott et al. 1996; Pardridge et al. 2002) which prevents 98% of the drugs from passing through it (Pardridge et al. 2007). It is now known that pulsed ultrasound combined with intravenous liposomes loaded with per-fluoro-carbon can temporarily open the BBB in a reversible and safe manner, allowing 7-fold better intracerebral penetration of intravenous delivered drug agents. While the first patients were performed at Pitié Salpêtrière (Carpentier et al Science 2016), several phase 2 trials internationally are now confirming the benefit of this ultrasound approach, its lack of toxicity and its patient benefit through increased survivals. Since ultrasound is 90% absorbed by the cranium, the patented option of the Salpêtrière Hospital was to take advantage of the tumor resection procedure to implant, instead of the cranial flap, an ultrasound device that can be activated on demand during subsequent chemotherapy treatments (sonocloud). This "extra-dural" approach allows an easily repeatable opening of the BBB at each chemotherapy sessions by nurses and on a large brain volume to maximize the therapeutic effect. The complementary approach uses extra cranial focusing emitters device (exablate) to reach deep and focal brain targets preferentially for non-tumor pathologies (i.e. Parkinson).

13h30 - 14h00 NEUROLOGY

Speaker - [Nir Lipsman](#)¹

¹SRI, Sunnybrook Health Sciences Center, University of Toronto, Canada

Transcranial Blood Brain Barrier (BBB) Opening

Focused ultrasound (FUS) in the clinic represents the culmination of decades of research. The last several years have seen a rapid advance in its clinical adoption, harnessing FUS' myriad mechanisms from ablation to enhanced drug delivery across the blood brain barrier. FUS applications now span the clinical spectrum in neurological and psychiatric diseases, with insights still emerging from preclinical models and human trials into future directions and what the coming years may bring for this developing therapeutic tool. This presentation provides an overview of therapeutic ultrasound and its current and emerging indications in the brain, with a specific focus on where we are headed in the next decade. It examines the potential impact of FUS on the landscape of brain therapies as well as the challenges facing its further advancement and broader adoption.

14h00 - 14h30 DIGESTIVE SURGERY

Speaker - [Joan Vidal-Jové](#)¹

¹ Comprehensive Tumor Center Barcelona · Institut Khuab for Interventional Oncology, Barcelona, Spain

Histotripsy In The Liver: What Clinicians Want, What Patients Need

Histotripsy is a non-invasive, non-thermal, robotic cavitation tissue destruction and immune enhancement, surgical procedure. The purpose of this presentation is to: **i)** Understand the Mechanism of Action and differentiation from existing approaches to hepatic soft tissue destruction; **ii)** Understand the workflow and delivery of Histotripsy with emphasis on tissue response to histotripsy; **iii)** Review current preclinical and clinical evidence regarding histotripsy and future clinical opportunities. The transformative potential of Histotripsy lays in 3 characteristics: **1)** Precise and selective soft tissue destruction; **2)** Tumor and microenvironment disruption to enhance local delivery of other treatments; **3)** Local, regional, and systemic immune effects potential. We will discuss preclinical and clinical evidence with emphasis in the first in human liver study and recent clinical experiences.

14h30 - 15h00 GYNECOLOGY

Speaker - [Charles-André Philip](#)^{1,2}

¹Gynecology Department, Croix-Rousse University Hospital, Hospices Civils de Lyon, Lyon, France.

²LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

Endometrioses

Endometriosis is a benign functional pathology responsible for chronic pain and infertility that affects patients' quality of life. When medical treatment is impossible or ineffective, surgical management is discussed, but the benefits of it must be weighed against the high risks of complications and sequelae. HIFUs have been proposed for several years as a minimally invasive alternative to excision in peritoneal endometriosis lesions. Our team recently proposed for the first time to treat rectal endometriosis lesions by transrectal US guided HIFU. We will report the main stages of the implementation of this treatment and the clinical experiences of the first 80 patients. Finally, we would discuss the next steps of transrectal HIFU development in endometriosis and the potential impact of this treatment in the future.

15h00 - 15h30 COFFEE BREAK / EXHIBITS

Chairwoman (Part 2) - [Emily White](#)¹

¹Focused Ultrasound Foundation, Charlottesville, United States

15h30 - 16h00 OBSTETRICS

Speaker - [Christoph Lees](#)¹

¹Imperial College London, United Kingdom

Twin to Twin Transfusion Syndrome

Twin-twin transfusion (TTTS) is a potentially serious condition of identical twins that share a placenta. These 'monochorionic, diamniotic' twins may have abnormal blood flow connections within the placenta that lead to a circulatory imbalance, one twin become large and engorged with blood and the other anaemic and intravascular

volume depleted. If severe, this can lead to death of one or both fetuses in utero, miscarriage or severe preterm delivery. Invasive therapy using fetoscopic laser was first described by de Lia in the 1980s to treat TTTS however it has the risks associated with puncturing the uterine sac. Following the French led Eurofetus study (Senat 2004) the place of fetoscopic laser was established for more advanced disease, with amniodrainage sometimes reserved for earlier stages. The use of HIFU has been reported in Japan for the rare condition of twin reversed arterial perfusion sequence (TRAP) for the ablation of soft tissue to effect cessation of blood flow in the acardiac fetus. Over the last decade in a collaboration between Imperial College London, the UK's Institute of Cancer Research (ICR), Cambridge University and the Centre for Trials Research, Cardiff preclinical development of imaging, a user interface and therapeutic transducer mounted on a robotic arm has led to a bespoke designed, clinically usable HIFU system for human use. The results of stage 1 of a Phase 1 study of early gestation TTTS will be presented in respect of safety and signals of clinical efficacy.

16h00 - 16h30 **CARDIOLOGY**

Speaker - [Emmanuel Messas¹](#)

¹Hôpital Européen Georges Pompidou, Université Paris Descartes, France

Update on Non invasive ultrasound therapy for calcified aortic valve stenosis

Calcific aortic stenosis (CAS) is common among the elderly and has become a public health concern with the aging population. However, for a large subset of patients with CAS, an invasive treatment is not possible. Non-invasive ultrasound therapy (NIUT) could be an option for these patients. During this therapy, dense energetic cavitation bubble clouds are generated by short, high-pressure, ultrasound pulses (Valvosoft therapy) and are targeted against embedded calcifications in the aortic valve tissue, resulting in valve leaflet softening and restoration of mobility. Recently, a first-in-human study was performed to evaluate the safety and efficacy of this technique. We will present the last available result on the 40 patients who undergo Valvosoft therapy.

16h30 - 17h300 MUSCULOSKELETAL

Speaker - [Afshin Gangi](#)¹

¹Hôpital de Strasbourg, Strasbourg, France

Interventional radiology of musculoskeletal (MSK) tumours

Interventional radiology plays a major role in the management of MSK tumours. Many different percutaneous techniques are available. Some aim to treat pain and consolidate a pathological bone (cementoplasty); others aim to ablate tumour or reduce its volume (sclerotherapy, thermal ablation)., Image-guided techniques of primary and secondary MSK tumours with thermal ablation (laser, RFA, MW, Cryo, HIFU) and electroporation will be reviewed. For each modality, the principles, the indications and the results will be presented. The technical choice depends on the therapeutic intent –curative or palliative-, the need for consolidation, but also on the general status of the patient and the other therapeutic options. For the most complex cases, combined treatments can be required (embolization and/or ablation. However, the less disabling technique should always be considered first. HIFU application in MSK tumours is growing fast with the treatment of benign and malignant tumours. Thee promising fields of HIU applications are Vascular malformation and desmoid tumours.

Conclusions

17h00-17h15 (Ampère)

HIFUture

21 April 2023

Let's imagine today the ultrasound treatments of tomorrow!

17h00 - 17h15 CONCLUSIONS

[Gil Dubernard^{1,2}](#)

[Cyril Lafon²](#)

¹Gynecology Department, Croix-Rousse University Hospital, Hospices Civils de Lyon, Lyon, France.

²LabTAU, INSERM, Centre Léon Bérard, Université Lyon 1, Univ Lyon, F-69003, Lyon, France

After the success in 2021 of the 1st edition of the national HIFUture symposium, the 2nd edition 2023 will have gathered in the beautiful environment of the Palais de la Bourse (Lyon, France) the international clinical, academic and industrial experts in therapeutic ultrasound innovation.

We hope that this meeting will have allowed to promote the field and to create emulation between the participants for a transdisciplinary research. We believe that HIFUture 2023 will also have benefited from the international influence of the ISTU (also organized in Lyon) and associated this year with the European society EUFUS.

For the structuring of our community, we hope to be able to perpetuate these HIFUture meetings around therapeutic ultrasound by proposing to you to renew your participation in the years to come.

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21 April 2023

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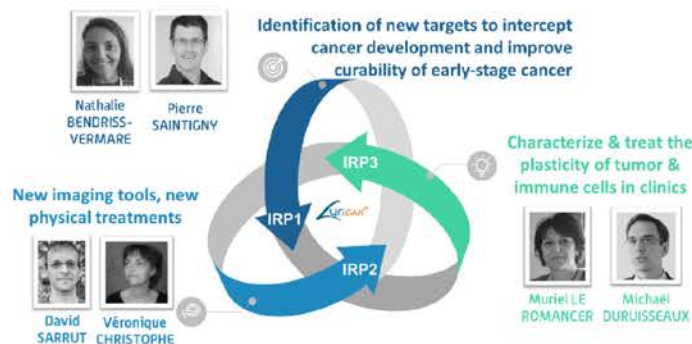
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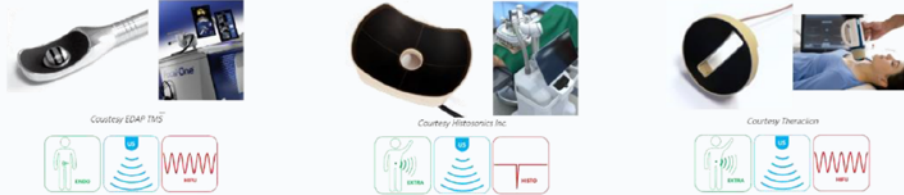
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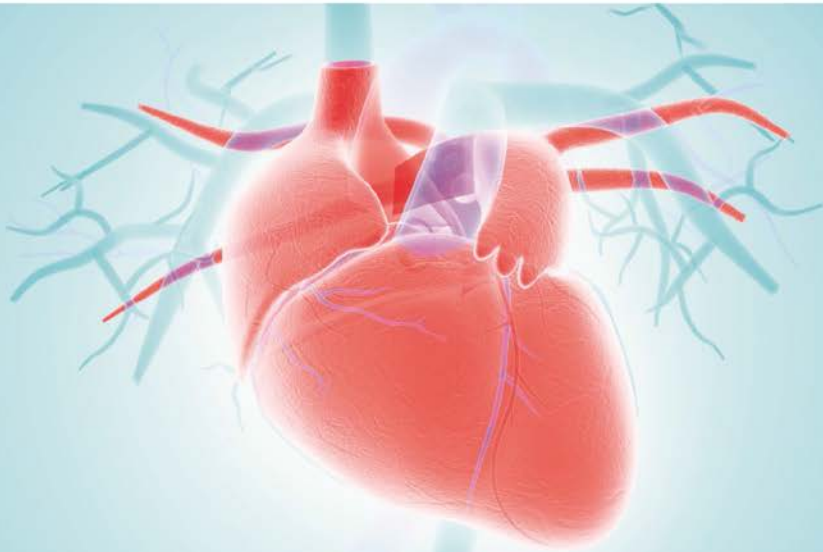
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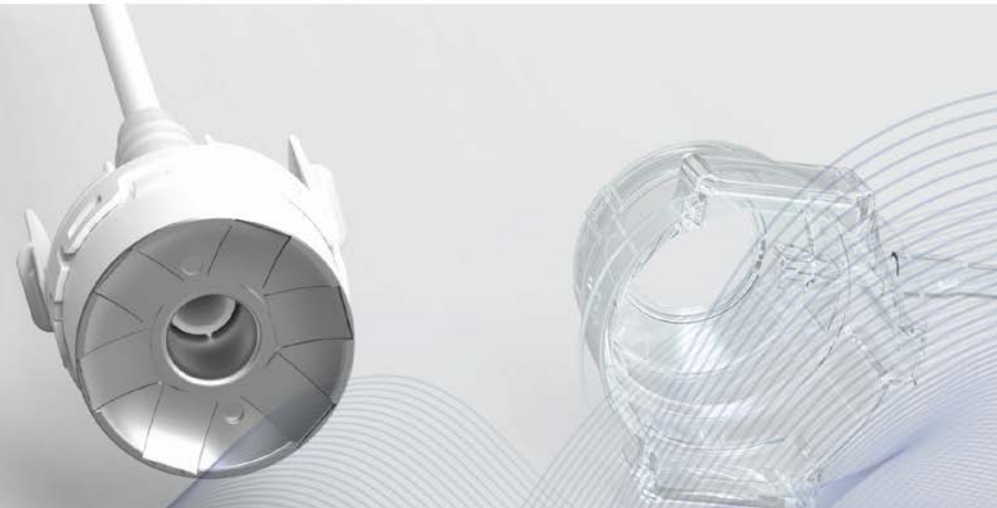




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HIFUture
21 April 2023

Laurent Milot (Hospices Civils de Lyon / LabTAU, INSERM, Univ Lyon, France)



After finishing medical school at Paris V, Pr Milot got his MD and MSc at the university of Lyon as a specialist in radiology. After a fellowship at the University of Toronto, he was subsequently hired as assistant professor in the medical imaging department and staff radiologist at Sunnybrook Health Science Center. He became associate professor, associate vice-chair of research and associate member at the Institute of Medical Sciences. After 11 years in Toronto, he came back to Lyon as deputy chief of the department of medical imaging at the Hôpital Edouard Herriot. His subspecialty is in diagnostic and interventional body radiology. After getting his PhD and HDR, he has been appointed as Full Professor of Diagnostic and Interventional Radiology in September

2021 at the University Claude Bernard Lyon 1 and Hospices Civils de Lyon and is a clinician scientist at the LabTAU, INSERM. Since then, he has been building an innovative clinical and research program linking innovations in diagnostic (radiomics, AI) and interventional (robotics, multimodal treatment, HIFU) radiology.

Chrit Moonen (University Medical Center Utrecht, Utrecht, The Netherlands)



Chrit Moonen did his masters in Molecular Sciences and his Ph.D. in biophysics (Wageningen University). He did part of his studies with Nobel Laureate Wüthrich in Zürich, Switzerland. He went for a postdoctoral period to the University of Oxford (Sir Georg Radda). He then worked at the University of California at Davis as a Visiting Research Scientist before becoming head of the NIH In Vivo NMR Research Center from 1987-1996. He moved back to Europe (Bordeaux, France) in 1996 where he has been director of the laboratory "Molecular and Functional Imaging: from Physiology to Therapy" until 2011. He is currently full professor at the Division of Imaging at the University Medical Center in Utrecht, the Netherlands. He coauthored over 250 scientific papers.

H-index is 76 (Google Scholar). He was President of the "International Society of Magnetic Resonance in Medicine" (ISMRM, 2006), of the "Society for Molecular Imaging" (2009), and of the European Society of Molecular Imaging (2016). His recent work is in molecular and cellular imaging, MRI guided Focused Ultrasound, and Image Guided Drug Delivery in the Center for Imaging Sciences, Imaging Division.

Maxime Lafond (LabTAU, INSERM, Univ Lyon, France)



Maxime Lafond received his Ph.D. in biomedical engineering from the Laboratory of Therapeutic Applications of Ultrasound, University Claude Bernard of Lyon, France, in 2016. He completed a JSPS Postdoctoral Fellowship at the Umemura-Yoshizawa Laboratory, Tohoku University, from 2017 to 2018, where he developed cavitation monitoring for sonodynamic therapy. He also completed a second postdoctoral fellowship from 2018 to 2021 at the Image-guided Ultrasound Therapeutics Laboratories, University of Cincinnati, where he worked on catheter-based cavitation-mediated drug delivery and bioactive gas delivery under the mentorship of Prof. Christy K. Holland. In 2021, he joined the Laboratory of Therapeutic

Applications of Ultrasound at the French National Institute of Health and Medical Research (LabTAU, INSERM U1032) as a research associate. His research interests include cavitation nucleation and monitoring, and its applications in ophthalmology and cancer therapy.

Jonathan Vappou (Icube, CNRS, University of Strasbourg, Strasbourg, France)



Jonathan Vappou holds a PhD in mechanical engineering from the University of Strasbourg, France. He joined the French National Center for Scientific Research (CNRS) in 2011 after a postdoctoral position at the *Ultrasound and Elasticity Imaging Laboratory* in Columbia University, NY. His main research interests include monitoring of focused ultrasound therapies, particularly by MRI, MR Thermometry and Elastography, and the development of computer-assisted technological solutions such as those based on robotics and navigation for improving these therapies. He is currently the head of the *Robotics, Data Science and Healthcare Technologies* team of the ICube laboratory, University of Strasbourg. He is also the director of the TechnoFUS joint laboratory (ICube/Image

Guided Therapy) whose objective is to develop new technologies in Imaging, Robotics and Electronics dedicated to therapeutic ultrasound.

Nadya Pyatigorskaya (APHP – Neuroradiology / Brain Institute – ICM, Paris, France)



Nadya Pyatigorskaya is a Neuroradiologist in the Neuroradiology department at the Pitié-Salpêtrière Hospital and a researcher at the Brain Institute (ICM) in Paris. She is an expert in Neuroradiology and Head and Neck imaging, with additional specialization in Movement disorders, PET-MRI, epilepsy and Tumor imaging, and skull base imaging. Since 2017, she has been working on High Intensity Focused Ultrasound (HIFU) and is currently the principal investigator of the first HIFU clinical trial in France. She works with a multidisciplinary team including neuroradiologists, neurosurgeons, neurologists, and physicists from Physics for Medicine, on the first HIFU machine in France. She has published approximately 90 original scientific articles and presented over 100 scientific communications in national and international congresses. Nadya Pyatigorskaya is a member of the Board of the French Radiology Society and the French Neuroradiology Society, as well as the European Society of Medical Imaging Informatics. She is also an active member of several other societies, including RSNA, ESNR, ISMRM, and the Movement Disorders Society. She is a member of the Editorial Board of the Journal of Neuroradiology.

Benoit de la Fournière (Hospices Civils de Lyon / LabTAU, INSERM, Univ Lyon, France)



Benoit de la Fournière is an Obstetrician-Gynecologist at the Croix Rousse Maternity Hospital in Lyon. He completed his specialization with inter-university degrees in Obstetric and Gynecological Ultrasound and Fetal Medicine. He then completed a Master's degree in "Congenital Anomalies". His clinical practice is obstetric with a subspecialty in Fetal Medicine. He is the reference ultrasound specialist at the Croix Rousse Antenatal Diagnosis Center for the diagnosis of fetal pathologies and the support of parents in these often difficult treatments. He is currently a PhD student at the LABTAU INSERM 1032 laboratory since 2022, under the direction of Dr. David MELO DE LIMA, and his research focuses on the applications of ultrasound in Fetal Medicine, particularly on the placental unit in the pre-clinical and clinical phases (NCT04003428). He is involved in teaching activities at the Faculty of Medicine and Midwifery in

Obstetrics. He is the director of the organization of the "Objective Structured Clinical Examinations" (OSCE) session at the Lyon Est faculty for the May 2023 exam and has been a member of the local pedagogical committee (Lyon 1) of the ECOS working group since 2020

Fabrice Bing (Hôpital d'Annecy, Metz-Tessy / Icube, CNRS, Université et IHU Strasbourg, France)



I am a radiologist specialized in interventional oncology (IO) and interventional neuroradiology (INR). After a fellowship in INR (Montreal (CHUM), Prs Raymond-Roy-Weill) in 2010, I learned various techniques of IO at Strasbourg (Hôpitaux Universitaires de Strasbourg, 2012-2014, Pr Gangi). My working place is the Centre Hospitalier Annecy Genevois (CHANGE) since 2014. I kept on working with the team of Pr Gangi and the ICube laboratory (Strasbourg, Dr Vappou) and passed a PhD in 2018 on "HIFU treatment of bone lesions: from simulation to clinical applications". Since 2016 I am at the head of the radiology unit of the CHANGE where many techniques of IO (cryotherapy, radiofrequency, microwave, laser, cimentoplasty, embolization) as other techniques of interventional radiology (thrombectomy, embolization) are performed. Thanks to the interventional radiology activity, the CHANGE is a stroke center and trauma center.

Romain L'Huillier (Hospices Civils de Lyon / LabTAU, INSERM, Univ Lyon, France)



Interventional Radiologist at the Edouard Herriot Hospital - University Hospital of Lyon. Ph Candidate at the LabTAU (Laboratory of Therapeutic Applications of Ultrasound).

[Aurélien Dupré](#) (Centre Lyon Bérard / LabTAU, INSERM, Univ Lyon, France)



Consultant in surgical oncology in the comprehensive cancer centre of Lyon since 2013. PhD degree awarded in 2015 about innovative techniques in liver surgery. Clinical speciality: hepatobiliary and pancreatic surgery, mini-invasive surgery. Research speciality: translational research, clinical research, HIFU

[Alexandre Carpentier](#) (APHP, Pitié-Salpêtrière Hospital ; Sorbonne University Paris, France)



Alexandre Carpentier was born in France, in 1970. He is an Academic Neurosurgeon performing brain tumor and epilepsy surgery at Pitié-Salpêtrière Hospital, Paris, France, the largest neurological hospital in Europe. In 2007, he became a Professor of neurosurgery and medicine at Paris VI Sorbonne University School of Medicine, Paris, where he focuses on developing new minimally invasive surgical procedures. In 2006, he founded the Advanced Surgical Technologies Research Laboratory, Paris 6 Sorbonne University, Paris. He is known for his numerous translational clinical trials and developments of new technologies, such as laser interstitial thermal therapy of brain tumor and epilepsy, ultrasound interstitial thermal therapy, and ultrasound opening of the blood–brain barrier. In 2010, he founded the university spin-off company (CarThera) for his ultrasound innovations that are now in clinical trial. He is always focused on medical practice needs and clinical routine feasibility of innovations. He has a unique expertise in medical devices research, development, regulation, and clinical trials.

[Nir Lipsman](#) (SRI, Sunnybrook Health Sciences Center, University of Toronto, Canada)



Nir Lipsman is a neurosurgeon and senior scientist at Sunnybrook Research Institute and Sunnybrook Health Sciences Center, and an Associate Professor in the Department of Surgery at the University of Toronto. He completed his medical degree at Queen's University and neurosurgical residency and PhD at the University of Toronto. Over the last 10 years, Dr. Lipsman has led several clinical trials of MR-guided focused ultrasound (FUS) in novel indications, including among the world's first experience of ablative FUS in essential tremor, obsessive compulsive disorder and depression, as well as global-first trials of FUS-enhanced BBB opening in primary and secondary brain tumours, Alzheimer's Disease, ALS and Parkinson's disease. Dr. Lipsman has

published over 170 peer-reviewed papers and textbook chapters, including in The Lancet and New England Journal of Medicine. He received the ISTU Early Career Investigator Award, the FUS Foundations International Ferenc Jolesz Award for Excellence, and was selected as one of Canada's Top 40 under 40. He is currently the co-director, along with Prof Kullervo Hynynen, of Sunnybrook's Focused Ultrasound Centre of Excellence, and the Director of Sunnybrook's Harquail Centre for Neuromodulation.

[Joan Vidal-Jové](#) (Institute Khwab for Interventional Oncology, Barcelona, Spain)



Joan Vidal-Jové is the Director of the Comprehensive Tumor Center Barcelona and works at the Institute Khwab for Interventional Oncology. He is a Surgical Oncologist that has developed his career in various institutions in the U.S. and Europe, both in the healthcare field, research in industry and public administration. Author of several publications and conferences, has received awards and research grants in Surgical Oncology, Diagnostic Imaging Techniques and Research in Health Outcomes. After an educational period in China, he learns the fundamentals of the Ablation of Tumors by Focused Ultrasound (HIFU) and returns to lead the first oncological FUS-HIFU Unit of his country. Since then, he has performed more than 200 oncological cases with Focused Ultrasound and led

clinical research, with special attention to pancreatic and liver tumors. He was the PI

of the First in Human Study of Histotripsy in Liver Tumors. Since then, he has been involved in the development of Histotripsy in liver, kidney and pancreatic tumors and researched the associated immune effects from the clinical viewpoint.

Christoph Lees (Imperial College London, United Kingdom)



Christoph is Professor of Obstetrics at Imperial College London; Honorary Consultant in Obstetrics and Head of Specialty for Fetal Medicine at the Centre for Fetal Care, Queen Charlotte's and Chelsea Hospital, Imperial College Healthcare NHS Trust; Clinical Director for Fetal Medicine for North West London and Visiting Professor KU Leuven (Belgium). Christoph qualified from Guy's Hospital, London in 1990. Following subspecialty accreditation in fetal-maternal medicine at King's College Hospital, London he established the fetal medicine unit at Addenbrooke's Hospital, Cambridge in 2001 and inaugurated the RCOG MFM subspecialty programme in 2006. His research interest is on fetal assessment and in particular the use of Doppler ultrasound to assess the

health of the baby, scanning in labour, and non-invasive fetal surgery. Professor Lees is the Chief Investigator of The Trial of Umbilical and Fetal Flow in Europe (TRUFFLE), a Collaboration of 51 Centres across Europe; co-founder of the International Working Group of Maternal Haemodynamics and Intrapartum ultrasound ISLANDs group. He was awarded £2.2m grant from the Medical Research Council for first in human studies of high-intensity focused ultrasound in 2017, a £2.5m grant from the NIHR in 2019 to undertake the TRUFFLE 2 RCT and a £2.1M grant from the NIHR for a study on ultrasound of breech pregnancy at 36 weeks in 2023.

Emmanuel Messas (Hôpital Européen Georges Pompidou, Université Paris Descartes, France)



Pr. Emmanuel Messas is MD PhD and Fellow of European Society of Cardiology, Head of Cardiovascular (CV) prevention and Vascular Medicine department and head of the CV ultrasound Ecolab at Hôpital Européen Georges Pompidou, Université of Paris and Inserm UMR 970, Paris, France. His main field of research is innovation in CV ultrasound imaging and therapy. He was research fellow in 1999-2001 in Cardiac ultrasound lab of Massachusetts General Hospital, Harvard Medical School under the supervision of Robert Levine world

known cardiologist on ultrasound and valve. Since his fellowship, all his research was to use ultrasound imaging innovative technique to better understand heart valve disease in order to cure them by noninvasive ultrasound therapy. Since 15 years, he forged as strong collaboration with world leader in Ultrasound Physics from Ecole Superior of Physics and Chemistry of Paris (ESPCI) initially with Mathias Fink in Langevin institute and now with Mickael Tanter team from INSERM team Physics for Medicine and especially with Mathieu Pernot. Using Ultrafastecho imaging, Shear wave imaging, and Ultrafast Doppler, they developed new research on arterial plus wave velocity, arterial wall stiffness, atherosclerosis plaque biomechanics evaluation. Their collaboration continue on the cardiac function evaluation using elastography and shear wave imaging for myocardial stiffness evaluation. Finally, since 8 years they fund a startup company called Cardiawave headed and co funded by Benjamin Bertrand, which developed a breakthrough disruptive technology on non-invasive ultrasound therapy creating shockwave on the calcification of the aortic valve of patient with severe symptomatic aortic valve stenosis. Pr. Messas is the PI of the international first in men study on this application. Already some promising result has been presented in multiple international cardiology meeting as European Society of Cardiology scientific meeting and American heart association meeting and was published in Circulation journal. Today, he continues this fruitful collaboration on ultrasound and cardiovascular diseases.

[Afshin Ganqi](#) (Hôpital de Strasbourg, Strasbourg, France)



Dr. Afshin GANGI received his primary and secondary education at the French International School of Tehran (Lycée RAZI) where he graduated in 1980. He studied medicine at the University of Reims in France. After passing the internship examination, he started his medical studies in Strasbourg in 1987, first in internal medicine, then in the pneumology department in intensive care and finally in the imaging department where he quickly became interested in interventional radiology. After his internship, he worked one year in Luxembourg with Professor R.F. DONDELINGER in interventional radiology. Doctor GANGI started his clinical training in Strasbourg in November 1991 in the neuroradiology and osteoarticular department with a particular interest in interventional radiology. He performed his first vertebroplasty in 1989, during his internship, and continued to develop image-guided procedures in interventional oncology, notably under combined guidance of televised scopy associated with CT as well as under MRI guidance. In 1995, Dr. GANGI completed his post-graduate thesis and obtained his doctorate in physics (laser thermics) at the

University of Strasbourg. In the same year, he was appointed as a lecturer at the University Hospitals of Strasbourg and in 2000 he became Associate Professor in Radiology. Since 2014 he has been working at King's College London for research in interventional oncology and HIFU as a Visiting Professor with Professor Andy ADAM. He holds numerous patents and is the author of over 300 refereed papers. He has over 40 book chapters to his credit and has presented over 500 papers at numerous national and international conferences. Currently, Professor GANGI is the head of the radiology and nuclear medicine department at the University Hospitals of Strasbourg and works in the interventional radiology department, with a special interest in interventional oncology. He actively participates in various international societies and is the former president of the European Society of Cardiovascular and Interventional Radiology (CIRSE).

Feng Wu (Nuffield Department of Surgical Sciences, University of Oxford, United Kingdom)



Professor Feng Wu received his medical training at Chongqing Medical University in China. In 1988 he began his research career in high intensity focused ultrasound (HIFU) therapy, and developed his own clinical HIFU device, with his work largely dedicated to treating solid tumors, including those of the liver, kidney, breast, pancreas, uterus, bone, and soft tissues. Until now Professor Wu and his teams have treated more than 50,000 patients, the largest population of HIFU treated cancer patients in the world. In 2002, Professor Wu was invited to help establish the first clinical HIFU Unit in the United Kingdom, and to assist in running clinical HIFU trials for the treatment of tumour patients in Churchill Hospital, Oxford University

Hospitals. His pivotal role in bringing this emerging technology to the UK has resulted in him becoming the first Chinese-trained clinician ever to be entered directly onto the specialist register in the UK - under the newly created Specialty of High Intensity Focused Ultrasound Therapy. Professor Wu is currently working as HIFU Consultant at Oxford University Hospitals, and also serving as Senior Clinical Scientist at Nuffield Department of Surgical Sciences, University of Oxford. He has published more than 200 papers in peer-reviewed journals and seven book chapters related to HIFU therapy, and served as Editor-in-Chief in the World Journal of Surgical Procedure and Editorial Board Member in nine peer-reviewed journals. He was one of the founders for International Society for Therapeutic Ultrasound (ISTU), and was selected as Secretary-General of ISTU for six consecutive years (2001-2006). Professor Wu received the Society's William and Francis Fry Award in 2013, and served as Honorary

Symposium President for the 4th International Symposium on Current and Future Applications of Focused Ultrasound in 2014.

Emily White (Focused Ultrasound Foundation, Charlottesville, United States)



Emily White, MD, joined the Foundation in 2016 as Director of Operations. In 2018, Emily expanded her role to include Managing Director of FUS Partners, the Foundation's efforts to help the focused ultrasound industry's commercialization efforts and expand their access to the MedTech capital markets as well as the Foundation's own venture philanthropy efforts. Prior to joining the Foundation, Dr. White was a private consultant working in operations and business development support in the healthcare and medical start-up space. Her clients have included everything from a 4,000+ employee, publicly traded, health care company to a brand new start-up with two employees. Her background includes training in general surgery, leadership positions in several highly technical start-up companies with federal clients, non-profit executive management and over 25 years of grant writing experience. She completed her undergraduate degree in Biology & Anthropology at Smith College and holds certification for Community Conflict Resolution from Loyola Law School. She is also a University of Virginia School of Medicine graduate.

Gil Dubernard (Hospices Civils de Lyon / LabTAU, INSERM, Univ Lyon, France)



Professor Gil Dubernard trained in Obstetrics and Gynecology with a specialization in surgery at the Assistance Publique Paris Hospital from 1997 to 2007. He defended his PhD Thesis in 2008 on the influence for fetal microchimerism on mammary adenocarcinomas associated with pregnancy. His clinical work was initially focused on the management of gynecological and mammary cancers, then his focus progressively moved toward the diagnosis and treatment of endometriosis. He entered the team of Professor RUDIGOZ at Croix-Rousse Hospital (Lyon, France) in 2007. In 2010 he was named University Professor-Hospital Practitioner and in

2015 was appointed manager of the Obstetrics Gynecology department. Since then, his work has been more and more focused on the diagnosis and management of endometriosis. He has developed a new technique for diagnosing endometriosis, which is known as 3D Rectosonography. The development of this ultrasound diagnostic technique enables him to consider management techniques other than surgery for rectal endometriosis. In 2016 Professor Dubernard joined LabTAU while supervising the PhD Thesis of Doctor Charles-André PHILIP. They have carried-out their first global phase I study on the treatment of rectal endometriosis with Focused Ultrasound in collaboration with the company EDAP TMS.

Cyril Lafon (LabTAU, INSERM, Univ Lyon, France)



Cyril Lafon was born in Saint Yrieix la Perche, France, in 1974. He earned his B.Sc. degree in Physics from University Blaise Pascal of Clermont Ferrand, France and University of Montreal, Quebec, in 1995, and his Ph.D. degree in Biomedical Engineering from University Claude Bernard of Lyon, France, in 1999. After developing interstitial HIFU probes during his Ph.D. study in INSERM Unit 281, Dr. Lafon joined for two years the Applied Physics Laboratory of the University of Washington, Seattle, as a postdoctoral research fellow. Dr. Lafon worked there on ultrasound induced hemostasis and the development of tissue mimicking phantoms for HIFU applications. Dr. Lafon was recruited by INSERM, Unit 556, in 2002 as a research scientist. He

is now research director and head of LabTAU, INSERM Unit 1032. His recent research interests focus on modeling ultrasound wave propagation, development of ultrasonic therapeutic devices for thermal ablation or drug delivery and communication by ultrasound for medical applications. In July 2016 and for one year, Cyril Lafon joined the department of radiation oncology of the University of Virginia in Charlottesville (USA).

Charles-André Philip (Hospices Civils de Lyon / LabTAU, INSERM, Univ Lyon, France)



Charles-André PHILIP was born in Lyon, France, in 1986. He obtained his MD degree from University Claude Bernard (Lyon, France), in 2014 and is specialized in Obstetrics and Gynecology. He obtained his Master of Science in Oncology from Lyon 1 University (Lyon, France) during his fellowship in the Lady Davis Institute for Medical Research at McGill University (Montreal, Canada) in 2015. His main clinical and research fields are endometriosis and oncology. He completed a 2 years fellowship in Gynecology-Obstetric in Croix-Rousse University Hospital (HCL, Lyon, France) and contributed with Pr. Gil Dubernard to the description and evaluation of 3D-Rectosonography, a new procedure combining tridimensional sonography and intra-rectal contrast for

the diagnosis of rectal endometriosis. He obtained his PhD thesis in 2020 in the LabTAU (INSERM Unit 1032) and is working alongside with EDAP-TMS, Pr Gil Dubernard and Cyril Lafon, to assess the role of HIFU in the treatment of posterior deep invasive endometriosis.

W. Apoutou N'Djin (LabTAU, INSERM, Univ Lyon, France)



W. Apoutou N'DJIN received the M. Eng. degree in Instrumentation from the National Graduate School of Engineering & Research Center of Caen (Ensicaen) in 2004, the M.S. degree in image & signal processing from the Centrale Graduate School of Lyon, France, in 2005, and the Ph.D. degree in biomedical engineering from the University of Lyon, Claude Bernard Lyon I, in 2008. He worked from 2005 at the French National Institute of Health and Medical Research, INSERM U556, Lyon, on the development of USgHIFU for intraoperative thermal ablations of liver metastases. From 2009, he joined for 3 years the Sunnybrook Research Institute (SRI), Imaging Research, Toronto, Canada, as a post-doctoral research fellow to study conformal MRgHIFU therapies for

endocavitary/interstitial thermal ablations of localized tumors in prostate and brain. Since 2012, he works as a Research Associate at LabTAU, INSERM U1032, Lyon. His research interests include image-guided HIFU for focal/conformal ablative therapies (localized cancers; dysfunctional tissues), novel ultrasound technologies (CMUTs),

mechanisms and applications of ultrasound neurostimulation. Dr. N'Djin is involved in translational research from numerical modeling to experimental development of therapeutic and image-guidance strategies. In 2019, he received the Frederic LIZZI Early Career Award of the International Society of Therapeutic Ultrasound (ISTU) at the 19th International Symposium for Therapeutic Ultrasound (ISTU 2019, Barcelona, Spain), for his contributions in therapeutic ultrasound.