Internship offered in M2
2018-2019

Responsible for internship

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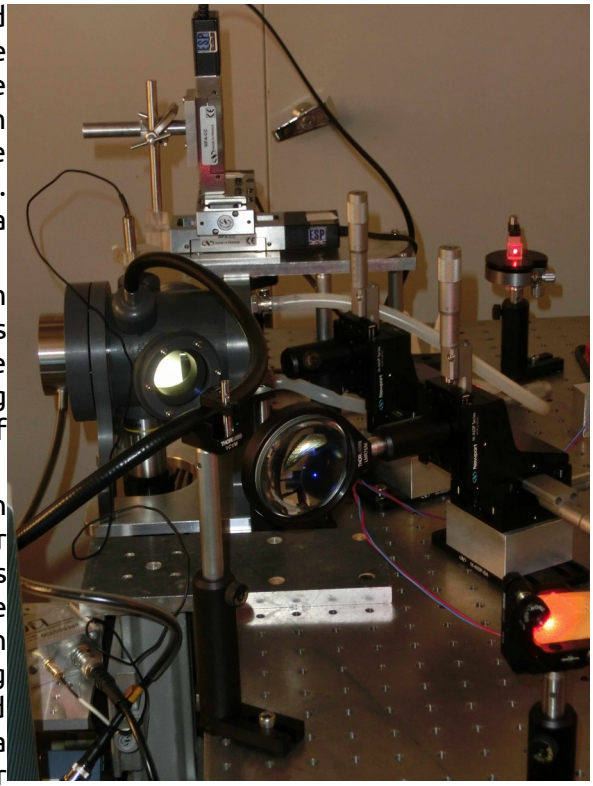
Internship topic: Acoustics vaporization of micro-droplets

The acoustic team for the NanoSciences of the Paris Institute of NanoSciences is looking for a candidate to study the droplet vaporization produced by a microfluidic system using focused ultrasound waves. These droplets are intended to play the role of vector for the transport of a drug and thus achieve a targeted therapy capable of delivering locally a large dose of active drug. This study therefore concerns the final phase of the process in which the drug is delivered in situ during the rupture of the membrane encapsulating the droplet. Droplets once vaporized can also serve as a contrast agent for ultrasound imaging.



This work is part of a research program involving four laboratories located in Paris (Institute of NanoSciences of Paris, Jean Le Rond d'Alembert Institute, Biomedical Imaging Laboratory, Laboratory of Statistical Physics of ENS) will mainly be conducted within the INSP.

An experimental set-up has already been realized, it includes a focused transducer for delivering acoustic pulses of arbitrary shapes and several hundred atmospheres of amplitude at focus, an optical display system with an objective and a camera, a system for measuring the radius by Mie scattering of a laser beam and a system for delivering the droplets in a controlled manner. The microfluidic chip for droplet synthesis also exists and is located at the LPS. We also have a numerical model taking into account the evolution of the cavitation germ and the elasticity of the materials

constituting the core-shell system of the encapsulated droplet. The work will consist on the one hand to perfect this tool on all its components and on the other hand to identify the characteristics of the materials, to search for the ultrasonic sequences and the pressure time evolution the most adapted to vaporize and then break the bubble thus created.

Strong skills in experimental physics, instrumentation, ultrasonic / optical or microfluidic methods would be appreciated.

Techniques involved: Acoustics, Mie scattering, non linear acoustics

Type of internship: experimental
Paid internship: Yes
Can this internship be continued for a PhD? Yes
If yes, type of PhD funding envisaged is: Ecole doctorale

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