Centre de Nanosciences et de Nanotechnologies (C2N)
CNRS – Université Paris-Saclay, Palaiseau, France

Master 2 internship – 2027

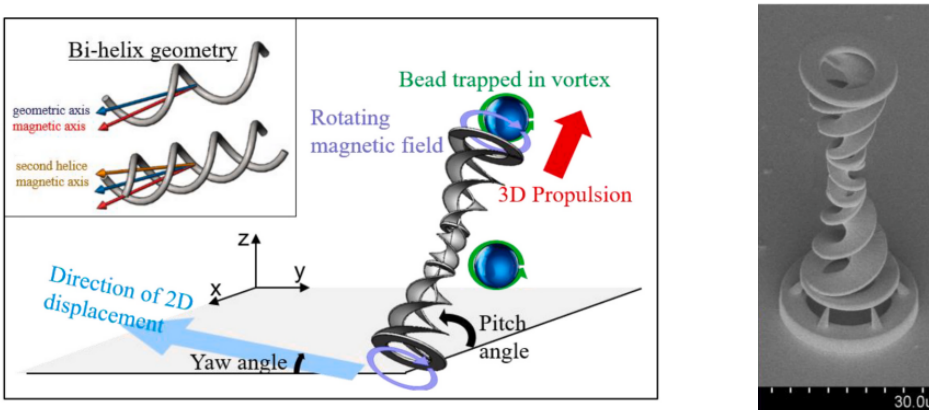
Bio-inspired magnetic microrobots for microscale manipulation

Research context

Inspired by bacterial flagella, magnetic microswimmers can be remotely actuated in liquids using external magnetic fields. In our previous work, we developed helical microswimmers capable of controlled motion and non-contact manipulation of microparticles in two and three dimensions [1,2]. These results provide a basis for investigating new microrobotic tools for biological and microfluidic systems.

Internship project

The objective of this internship is to study the motion of magnetic microswimmers and their interactions with microscopic objects in fluidic environments. The student will participate in the design and fabrication of microrobots using 3D microfabrication techniques and characterize their motion using a magnetic actuation setup and optical microscopy. Image processing and trajectory analysis will be used to interpret the experimental results. The integration of magnetic microrobots into microfluidic chips will also be explored, with potential applications in microscale transport and the manipulation of microorganisms, such as bacteria and microalgae.



Concept of 3D micromanipulation (left) and SEM image of a fabricated microswimmer (right). From our previous work [2], Figs. 1 and 3.

Candidate profile

Master 2 or final-year engineering student in physics, micro/nanotechnology, robotics, fluid mechanics or a related discipline. An interest in experimental research is essential. Experience in microfabrication, microscopy or programming would be appreciated.

Practical information

Duration: 6 months, starting in March 2027 (flexible).
Supervisor: Gilgueng Hwang, CNRS researcher, C2N.
Contact: gilgueng.hwang@cnrs.fr
The internship may be followed by a PhD, subject to funding availability. Internship funding is currently being sought.

References

[1] A. Paris, D. Decanini and G. Hwang, Sensors and Actuators A 276, 118–124 (2018). doi:10.1016/j.sna.2018.04.019.
[2] A. Paris, D. Decanini and G. Hwang, Microelectronic Engineering 235, 111466 (2021). doi:10.1016/j.mee.2020.111466.