

Da un secolo, oltre.

# Robots inside the body: from implants to medical microsystems

Robots are around us and currently also in our houses. The past decade has witnessed the advent of robots in the surgical room where they act as valuable tools to support minimally invasive medicine. What if we employ a robotic approach to design the next generation of implantable devices supporting or replacing our vital internal organs? What if we employ a robotic approach to develop untethered machines able to navigate body lumina and perform targeted therapeutic tasks?

In this seminar we will analyze these questions and present challenges and opportunities offered by the field of surgical robotics in the attempt to bring robots inside the body. In analyzing this paradigm shift, I will present some of the research activities carried out by my group. In particular, we will see how mechatronics, smart materials and soft robotics can help develop novel solutions for replacing pancreatic and urinary system functionalities.

We will then go down the scale to see tiny machines can be smart and effective while being passive. Novel microfabrication, control and tracking paradigms will be analyzed to get a glimpse of the field of medical microrobotics.



## SPEAKER: Veronica Iacovacci, Associate Professor

the BioRobotics Institute, Sant'Anna School of Advanced Studies

Veronica Iacovacci obtained the M.Sc. Degree in Biomedical Engineering at University of Pisa in 2013 (full marks, *cum laude*) with a thesis entitled "*Design and development of a mechatronic implantable system for the refilling of artificial organs*". In October 2013 she joined the Surgical Robotics and Allied technologies Area at Scuola Superiore di Studi Universitari e Perfezionamento Sant'Anna (SSSA) as a PhD student and she obtained the Ph.D. in Biorobotics (full marks, *cum laude*) with a thesis on smart magnetic microsystems for targeted therapy. Both thesis were awarded as best thesis by the Italian national Bioengineering group.

From October 2018 to March 2019 she was Post-doctoral Fellow at the Multi-Scale Robotics Lab at ETH Zurich and from April 2019 to September 2020 at the BioRobotics Institute of Scuola Superiore Sant'Anna. From September 2023 to August 2023 Veronica was Marie Curie Skłodowska Global Fellow jointly at Scuola Superiore Sant'Anna (Pisa - Italy) and at the Chinese University of Hong Kong (Hong Kong - SAR) with the project (MAMBO - Magnetic swarm for liver chemoembolization). Prof. Iacovacci was recently awarded with an **ERC Starting grants to develop the first generation of implantable microrobots**. She is currently Associate Professor in Biomedical Robotics. Her research interests include medical microrobots and fully implantable devices with a focus on programmable magnetic structures, high resolution imaging and tracking and wireless activation at small scales. She serves as Associate editor for the IEEE Transactions on Medical Robotics and Bionics and for the main conferences dealing with medical robotics. She is principal investigator in several European project and supervisor of about 10 PhD and MSc students.

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14.00 – 17.00

Centro Didattico Morgagni  
Room 012

### Organizer:

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