

Webinar of the IEEE TC Micro/Nano Robotics and Automation

The IEEE Technical Committee for Micro/Nano Robotics and Automation presents a series of online seminars. **One selected speaker will present cutting-edge research** in the micro/nano robotics field. Join us **Wednesday, December 18th, at 2 PM (UTC)**, for one hour. We will welcome:

Prof. Veronika Magdanz

Assistant Professor in Biomedical Engineering at the University of Waterloo, Canada



Title: Biohybrid and bioinspired microrobots for localized medical interventions

Abstract: The architecture and motility of sperm cells provide excellent components for biohybrid microrobots, either as propulsion source or structural templates. 1–3 and have thus been explored for applications such as targeted drug delivery and sperm manipulation. Further, the combination of sperm cells with magnetic nanoparticles has allowed their magnetic actuation and enhanced imaging abilities with medical imaging modalities.4 Additionally, studying the interactions of sperm cells in vitro gives fascinating implications for the design of flexible and multiflagellated microrobots. This leads us to

bioinspired design of flexible, magnetic small-scale robots for a variety of medical interventions such as localized drug delivery and noninvasive surgery.

1. Magdanz, V., Sanchez, S. & Schmidt, O. G. Development of a Sperm-Flagella Driven Micro-Bio-Robot. *Adv. Mater.* 25, 6581–6588 (2013).
2. Magdanz, V. et al. IRONSperm: sperm-templated soft magnetic microrobots. *Sci. Adv.* 6, eaba5855 (2020).
3. Magdanz, V. et al. Spermatozoa as Functional Components of Robotic Microswimmers. *Adv. Mater.* 29, 1606301--n/a (2017).
4. Middelhoek, K. I. N. A., Magdanz, V., Abelmann, L. & Khalil, I. S. M. Drug-Loaded {IRONSperm} clusters: modeling, wireless actuation, and ultrasound imaging. *Biomed. Mater.* 17, 65001 (2022).

Bio: Dr. Veronika Magdanz is Assistant Professor in Biomedical Engineering at the University of Waterloo, supporting the Biomedical Engineering program in her teaching, and is core member of the Waterloo Institute for Nanotechnology. Her research team develops wireless small-scale magnetic robots for biomedical applications as well as tools for novel sperm diagnostics. With the help of wireless small-scale robots, the aim is to achieve highly localized and active transport of drugs, which has huge potential in the treatment of infections and cancer. Further, these tiny machines can be used for minimal invasive surgery such as removal of occlusions (e.g. blood clots, kidney stones, tumours) or delivery of cells. Overall, the goal is to make medical interventions less invasive and more targeted.

Magdanz studied Biotechnology at the TU Braunschweig, Germany, and conducted her PhD studies at the Leibniz Institute for Solid State and Materials Research IFW Dresden. During her PhD, she pioneered the development of a novel type of microrobots driven by motile sperm cells. From 2017-2020, she was Open Topic Postdoc at the TU Dresden, Germany, investigating sperm migration and sperm-particle interactions for the development of diagnostic tools for reproductive biology. In 2020, Veronika Magdanz was awarded a Feodor-Lynen Fellowship from the Alexander von Humboldt Foundation, which allowed her to join the Institute for Bioengineering of Catalonia in Barcelona, Spain. From 2020-2022, she developed flexible magnetic microrobots for cell delivery and 3D printing of muscle tissue. In 2021, she received a Junior leader Fellowship from the La Caixa Foundation.

The expertise of Dr. Magdanz is highly interdisciplinary and ranges from microfabrication to cell biology, material science and magnetic actuation. She has published over 40 peer-reviewed articles, many of them in high impact journals.

Link to department website: [Veronika Magdanz | Systems Design Engineering | University of Waterloo](#)

WIN website: [Veronika Magdanz | Waterloo Institute for Nanotechnology | University of Waterloo](#)

Lab website: [Dr. rer. nat. Veronika Magdanz – Assistant Professor in Biomedical Engineering](#)

Link for the connection:

<https://cnrs.zoom.us/j/99446133720?pwd=TIGVZFEE9D4HrSzlrbutBU9fORMC8N.1>



More information on the IEEE Technical Committee for Micro/Nano Robotics and Automation webpage:

<https://www.ieee-ras.org/micro-nano-robotics-and-automation/activities>

In case of questions, please contact aude.bolopion@cnrs.fr