

23rd nanobiofluids seminar

2026 April 27th, 14:00-15:00

Seminar room (312-314), 3rd Floor, Bldg. No.3

<https://www.infront.kyoto-u.ac.jp/en/access/>

[Zoom link](#)

***Candida albicans*'s hyphae pathfinding as a proxy for virulence**



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Abstract

How living organisms utilize physical mechanisms to sense their environments and make informed decisions is an open question at the interface of biology and physics. In fungi that produce long, micro-sized multi-cellular filaments, or hyphae, decisions are taken by growing tip cells and later imprinted onto the rest of the filament. In this talk, I will present our recent work on the pathfinding modalities of hyphae produced by the opportunistic fungal pathogen *Candida albicans*, whose ability to cross intestinal epithelial layers is associated to severe systemic infections in humans. I will first describe how *C. albicans* hyphae, when confined to free surfaces into dedicated microfluidic channels, explore their surrounding by turning their tip cells into helical sensory springs. Next, when challenging *C. albicans* hyphae from strains of various virulence potential inside micro-mazes, we find that the highest virulence is associated with a combination of short range exploration and long range directionality. Overall, our ‘fungifluidic’ approach, by enabling hyphal navigation into controlled microenvironments, may provide novel descriptors of the pathogenic potential of *C. albicans* strains.

Biography

Dr. Villard is a research director at the National Centre for Scientific Research (CNRS) in France. She began her career in 1995 in the field of superconductivity, combining theoretical and experimental work in both fundamental and applied science.

In 2006, she initiated a research theme in the field of neuroscience. Initially focusing on the recording of electrical activity of neuronal microcircuits, she became increasingly interested in the biophysical aspects of these networks at the cellular level, i.e. neuronal growth and polarization. This thematic evolution was the driving force to join the Physics of Cells and Cancer laboratory at Curie Institute in Paris in 2013, then the Pierre-Gilles de Gennes Institute for microfluidics. This gave her the opportunity to integrate microfluidic tools into her research in neuroscience, then soon after in cancer biomechanics and lastly microbiology.

In January 2022, she moved to the « Interdisciplinary Laboratory for Tomorrow Energies » in Paris to initiate new research themes dedicated to the energy, climate and environmental transitions within interdisciplinary approaches including Humanities and Social Sciences. She currently holds a position of visiting professor at Tokyo College, University of Tokyo.

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