

## PLENARY TALK (MATHEMATICS AND MEDICINE)

**Decoding the Smart Strategies of Microbial Invaders: A Mathematical Perspective on Bacterial and Viral Infections**PAULA DE OLIVEIRA<sup>a</sup><sup>a</sup> Institution: Centro de Matemática da Universidade de Coimbra

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**Abstract**

Although they are simple organisms, bacteria and viruses exhibit highly sophisticated behaviors that allow them to survive by developing resistance to treatments or evading the immune system. Understanding those 'smart' behaviors is crucial not only for developing effective treatments but also for predicting the future trajectory of infections in an ever-evolving microbial world. In this talk, we will build mathematical models to understand the remarkable strategies of those pathogens. The models are based on systems of partial differential equations coupled with ordinary differential systems. We address the development of the models, their theoretical properties, and their computational simulation, in an integrated manner.

**References**

- [1] R. Bernardes, J. A. Ferreira, M. Grassi, M. Nhangumbe, Paula de Oliveira: *Fighting Opportunistic Bacteria in Drug Delivery Medical Devices*. SIAM Journal on Applied Mathematics **79** (6) (2019). <https://doi.org/10.1137/19M1259912>
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## SHORT BIO

PAULA DE OLIVEIRA

Paula de Oliveira studied in Paris VI, under the supervision of Philippe Ciarlet, in the field of Finite Element Methods. She has a PHD from the University of Coimbra, where she was full professor in the area of Applied Mathematics. P.O is a member of the group of Numerical Analysis and Optimization of the Centre of Mathematics of the University of Coimbra.

She has authored -or co-authored- a meaningful number of scientific papers. Since 2010, the focus of her research is the study of mathematical models in medicine with particular emphasis in ophthalmic diseases, cardiovascular diseases, and infectious processes.

Paula de Oliveira held positions in the Department of Mathematics of the University of Coimbra and the Centre of Mathematics of the University of Coimbra. She was the first President of the Instituto de Investigação Interdisciplinar (III) da Universidade de Coimbra, an institution that brings together research Centers at the University of Coimbra, in all areas, and whose focus is to promote interdisciplinarity.