OIST OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY
沖縄科学技術大学院大学

THEORETICAL SCIENCES VISITING PROGRAM

TSVP TALK

Mathematical Modelling Across Scales

From Microscopic to Macroscopic

2024
THU. **Oct. 3**

15:00–16:00

HYBRID L5D23, ZOOM

For zoom and other details scan QR code or visit groups.oist.jp/tsvp

In this talk, I will present examples of constructing mathematical models for the same natural phenomenon at different time/space scales, particularly at microscopic, mesoscopic, and macroscopic levels. In the case of fluids, this hierarchy of scales begins with Newton's laws of motion, passes through the Boltzmann equation, and reaches up to fluid equations such as the Euler or Navier-Stokes equations. At each stage of this connection, I will discuss which type of questions mathematicians aim to answer. I will then focus more on the mesoscopic and macroscopic scales, providing examples of mathematical models from my research area. Specifically, I will discuss run-and-tumble models for chemotactic bacteria and differential equations used in modelling structured populations, such as neuron populations and selection-mutation processes.

Delft University of Technology

Havva Yoldas

Havva Yoldaş is an assistant professor at the Delft Institute of Applied Mathematics, TU Delft in the Netherlands. Her research focuses on analysis of partial differential equations (PDEs) arising from applied sciences. She is particularly interested in well-posedness and long-time behaviour of PDEs appearing in structured population dynamics (neuron population models, growth-fragmentation equations etc.), kinetic theory (Boltzmann-type equations, run and tumble equations for bacterial chemotaxis) and coupled PDE models such as cross-diffusion systems for competing species.

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CONTACT Office of the Dean of Research tsvp@oist.jp