第32回早稲田大学
数学・応用数理談話会

日時：2025年9月2日（火）

場所：早稲田大学西早稲田キャンパス　63号館2階05会議室

アクセス：https://www.waseda.jp/top/access/nishiwaseda-campus

早稲田数学応数談話会 URL: http://www.math.sci.waseda.ac.jp/math/

13:30–14:30

Speaker: Prof.Xue-Mei Li

（EPFL and Imperial College London）

Title：Long-Range Memory in Stochastic Equations.

14:30–15:00: tea time（04会議室）

15:00–16:00

Speaker: Prof.Anne de Bouard

(Ecole Polytechnique, France, & WIAS, Waseda University)

Title：Nonlinear dispersive equations, solitary waves and noise

16:00–16:30: tea time（04会議室）

16:30–17:30

Speaker: Prof.Martin Hairer

（EPFL and Imperial College London）

（2014年フィールズ賞受賞者）

Title：Top Lyapunov exponent for advection-diffusion

主催：早稲田大学理工学術院基幹理工学部数学科・応用数理学科
早稲田大学理工学術院総合研究所・重点領域「数理科学研究所」

第 32 回早稲田大学　数学・応用数理談話会

日時：2025 年 9 月 2 日(火) 13:30～17:30
場所：早稲田大学西早稲田キャンパス 63 号館 2 階 05 会議室

【13:30-14:30】
Speaker: Xue-Mei Li 先生　(EPFL and Imperial College London)
Title：Long-Range Memory in Stochastic Equations.
Abstract：
Autocorrelated stochastic processes have long been observed in time series data and extensively studied in statistics. Yet, only recently has long-range dependence emerged as a central theme in the theory of stochastic differential and partial differential equations. This talk explores the role of long-range temporal and spatial correlations in shaping multi-scale stochastic dynamics. We begin with classical slow/fast systems for stochastic differential equations, traditionally grounded in Markovian frameworks and Itô calculus. We then examine how these foundational tools must adapt when the driving noise exhibits memory.

14:30-15:00: tea time（04 会議室）

【15:00-16:00】
Speaker: Anne de Bouard 先生(Ecole Polytechnique, France & WIAS, Waseda University)
Title：Nonlinear dispersive equations, solitary waves and noise
Abstract：
Nonlinear dispersive waves in general, and solitons in particular, are “universal” objects in physics: they describe the propagation of hydrodynamic waves as well as localised waves in plasma physics, the propagation of light in optical fibres or energy transfer phenomena in molecular systems, vortices in Bose-Einstein condensates, and so on. In all these situations, the formation of coherent and stable spatial structures has been observed experimentally and can be explained by the theory of integrable non-linear equations. However, none of these systems is exactly described by an integrable equation; these models are asymptotic models. Moreover, when microscopic phenomena come into play, the influence of temperature may not be negligible, which generally gives rise to random perturbations of the macroscopic model. The aim of this general audience seminar will be to introduce some of these dispersive models in different contexts, to explain how to take these random perturbations into account and to give some results concerning the influence of these perturbations on the dynamics of these dispersive waves.

16:00-16:30: tea time（04 会議室）

【16:30-17:30】

Speaker: Martin Hairer 先生（EPFL and Imperial College London）

（2014 年フィールズ賞受賞者）

Title：Top Lyapunov exponent for advection-diffusion

Abstract：

We show that, for a class of random velocity fields that cover solutions to the stochastic Navier-Stokes equations, the Eulerian Lyapunov exponent for passive scalar advection/diffusion is finite. This gives in particular a lower bound of order κ^2 on the Batchelor scale, complementing the (conjecturally sharp) upper bound of order $\sqrt{\kappa}$ recently obtained by Bedrossian, Blumenthal, and Punshon-Smith. The proof relies on constructive bounds on the projective process that allow us to keep track of its dependence on the diffusion coefficient.