



# APPLIED MATHEMATICS COLLOQUIUM: Shake Your Hips: An Active Particle With A Fluctuating Propulsion Force

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## About The Speaker:

Jean-Luc Thiffeault is a Professor of Mathematics at the University of Wisconsin - Madison. He received his PhD in Physics from the University of Texas - Austin in 1998. His research interests include transport and mixing in fluid dynamics, topology and dynamical systems, and microswimmers as active matter. He has given the AMS Invited Address at the SIAM annual meeting, as well as plenary talks at AMS, SIAM, and APS-Division of Fluid Dynamics meetings.



## Date:

4/2/2021

## Time:

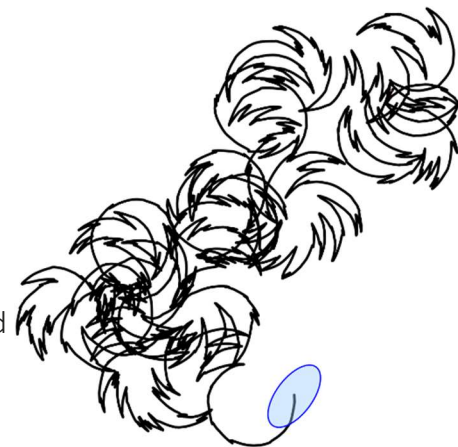
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## Link:

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[snsgradstaff@ucmerced.edu](mailto:snsgradstaff@ucmerced.edu)  
for the Zoom link and  
passcode.

## Abstract:

The active Brownian particle (ABP) model describes a swimmer, synthetic or living, whose direction of swimming is a Brownian motion. The swimming is due to a propulsion force, and the fluctuations are typically thermal in origin. We present a 2D model where the fluctuations arise from nonthermal noise in a propelling force acting at a single point, such as that due to a flagellum. We take the overdamped limit and find several modifications to the traditional ABP model. Since the fluctuating force causes a fluctuating torque, the diffusion tensor describing the process has a coupling between translational and rotational degrees of freedom. An anisotropic particle also exhibits a noise-induced drift. We show that these effects have measurable consequences for the long-time diffusivity of active particles, in particular adding a contribution that is independent of where the force acts. This is joint work with Jiajia Guo.



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