Mathéo **Aksil** | Curriculum vitae

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Education

PhD at laboratoire Jean Perrin, Sorbonne Université & CNRS **Paris**
- Theoretical biophysics. *2024–2027*
Supervisor : Silvia Grigolon. *Keywords :* out of equilibrium dynamics, developmental processes, gene regulation. Collaboration with Callum Britton and Dr. Gunnar Pruesnner (Imperial College).

Master 2 in Physics, ENS-PSL & Dauphine-PSL **Paris**
- Macroscopic physics and mathematical modeling. *2023–2024*
Relevant Coursework: Instabilities and nonlinear phenomena, Systems out of equibrium and nonlinear dynamics, Advanced fluid dynamics, Dynamical systems, Advanced biophysics, Active matter and collective behaviour, Physics of multicellular systems, Numerical methods for fluid dynamics, Non linear solid mechanics (experimental project at PMMH lab). Additional courses on General biology, Molecular biology, Computational neuroscience.

Physics degree, ENS-PSL **Paris**
- Intensive program on fundamental physics. *2021–2024*
Relevant Coursework: Quantum Mechanics and QFT, Statistical Physics, Phase transition, Soft Matter, Biophysics, Special Relativity and Electromagnetism, Solid State Physics, Hydrodynamics, Mathematics, Perturbative Methods. Additional courses on Biology, Economy and Climate Physics.

Skills and Interests

Software: LaTeX · *TikZ* · *ImageJ* · *LabView*

Programming: *Python* · *Numpy* · *SciPy* · *Matplotlib* · *TrackPy* · *C++* · *Gnuplot* · *GitHub*

Analytical tools: *Doi-Peliti field theory* · *Diagrammatic expansions* · *Multiple scale expansions* · *Bifurcations*

Articles

Reentrant transition to collective actuation in active solids with a polarizing field 2025
- Accepted in Physical Review Letters .
Authors : P. Baconnier, **M. Aksil**, V. Démery, O. Dauchot. Model experiments, numerical simulations, and theoretical analysis are combined to reveal how an external field affects the dynamics of an active elastic system.

Breaking of a floating particle raft by water waves 2024
- Published in Physical Review Fluids 9, 094302 .
Authors : L. Saddier, A. Palotai & **M. Aksil**, Michel Tsamados, and Michael Berhanu. Editors suggestion, featured in the *Physics* magazine. In a water tank, a granular raft is fractured by gravity surface waves. After the characterization of the collapse mechanism, we track the resulting fragments and study their properties throughout the whole process.

Teaching and Outreach

Tutorials (with *Contrat de Monitorat Enseignant CME*) 2025-2026
- Numerical modelling for physics : 60 hours.
Course combining programming and physics, guiding students in developing Python-based modeling skills through active learning and team projects that emphasized problem-solving.

Scientific communication 2024-2025
- Interventions about science and the world of research.
Popularization of the Jean Perrin lab activity for a young audience aging from primary school to high school, living in disadvantaged area. Organization of workshops at the lab with the various team of experimentalists.

Tutoring classes 2020-2024
- Weekly 2 hours sessions given to Sorbonne Université (2020-2021) and IPESUP students (2022-2024).
It consisted of helping students to understand their mathematics or physics classes and exercise sessions. The program covered more or less basic electronics, optics and mechanics on the physics side.

Research experience

Noise filtering mechanisms for robust life development 04/2024 – 07/2024

- M2 internship, Jean Perrin Laboratory, Sorbonne University, Paris (France).

Supervisor : Silvia Grigolon. Stochastic gene circuits involved in development are studied using numerical and analytical methods, inspired by statistical field theory.

Understanding brain stimulation through dynamical systems 03/2023 – 07/2023

- Vrije Universiteit, Amsterdam (the Netherlands).

Supervisor : Daniele Avitabile, Mathematics department. Numerical simulations performed on a network made of nonlinearly connected neural populations.

Dispersion and fracture of a granular raft by waves 10/2022 – 02/2023

- Experimental project, MSC Laboratory, Paris-Cité University, Paris (France).

Supervisor : Michael Berhanu. Image processing for fragments tracking and data analysis. Poster at the *Rencontres du Non-Linéaires* 2023. Article in Physical Review Fluids.

Effect of a polarizing field on the dynamics of an active solid 07/2022

- Gulliver Laboratory, ESPCI, Paris (France).

Supervisors : Olivier Dauchot and Paul Baconnier. Experiments performed on a synthetic active solid, made of self-propelled polar units connected by springs. Contributed talk by Paul Baconnier on the topic at the APS March Meeting 2023.

Languages and Personal Interests

Languages: French (native), English (C2 level at Cambridge Advanced Exam), German (beginner).

Hobbies: Literature, Anthropology, History of science.

Sport: Running, Football, Climbing