ALAIN BLAUSTEIN

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APPOINTMENTS

Research Scientist (Chargé de Recherche) *2025 - Present*
Inria centre at the University of Lille in the team RAPSODI

S. Chowla Postdoctoral Research Assistant *2023 - 2025*
Pennsylvania State University

EDUCATION

Ph.D. in Mathematics *2020 - 2023*
Université Toulouse III
Advisor: Prof. Francis Filbet

M.S. and B.S. in Mathematics *2016 - 2020*
École Normale Supérieure de Rennes

Agrégation externe de Mathématiques *2018 - 2019*
École Normale Supérieure de Rennes
Major: Scientific Computing

RESEARCH INTERESTS

My research interests lie in the **asymptotic** and **numerical analysis** of **partial differential equations** for interacting agents in models with application in **kinetic theory**, **neuroscience** and **chemotaxis**.
I focus on establishing links between the multiple scales inherent to these systems. Specifically, I have worked on longtime behaviors and macroscopic limits of these systems. I aimed, on the one hand, at proving theoretical results quantitatively bridging these scales and, on the other hand, at designing numerical methods which preserve these connections.

LIST OF PUBLICATIONS

(1) **Concentration phenomena in FitzHugh-Nagumo's equations: a mesoscopic approach** *2023*
SIAM J. Math. Anal. 55 (2023), no. 1, p. 367-404, with F. Filbet.
https://hal.science/hal-03515748/

(2) **Large coupling in a FitzHugh-Nagumo neural network: quantitative and strong convergence results** *2023*
J. Differential Equations 374 (2023), p. 218–266.
https://hal.science/hal-03619446/

(3) **Diffusive limit of the Vlasov-Poisson-Fokker-Planck model: quantitative and strong convergence results** *2023*
SIAM J. Math. Anal. 55 (2023), no. 5, p. 5464-5482.
https://hal.science/hal-03820110/

(4) **On a discrete framework of hypocoercivity for kinetic equations** *2024*
AMS Math. Comp. 93 (2024), no. 345, p. 163-202, with F. Filbet.
https://hal.science/hal-03792511/

(5) **A structure and asymptotic preserving scheme for the Vlasov-Poisson-Fokker-Planck model** *2024*
Journal of Computational Physics 498 (2024), n° 112693, with F. Filbet.
https://hal.science/hal-04140240/

(6) **Concentration profiles in FitzHugh-Nagumo neural networks: A Hopf-Cole approach** *2024*
Disc. Cont. Dyn. Syst. - Series B, 29 (2024), no. 4, p. 2018-2042, with E. Bouin.
https://hal.science/hal-04407014/

(7) **Derivation of the bacterial run-and-tumble kinetic model : quantitative and strong convergence results** *2025*
Studies in Applied Mathematics, https://doi.org/10.1111/sapm.70060.
https://hal.science/hal-04336656/

LIST OF PRE-PRINTS

(1) **Longtime and chaotic dynamics in microscopic systems with singular interactions**, *with A. Béjar-López, P.-E. Jabin, J. Soler.* *2024*
https://arxiv.org/abs/2411.08614

(2) **Structure preserving solver for Multi-dimensional Vlasov-Poisson type equations**
https://hal.science/hal-04440391/ *2024*

(3) **A structure and asymptotic preserving scheme for the quasineutral limit of the Vlasov-Poisson system**, *with G. Dimarco, F. Filbet, M.-H. Vignal.* *2025*
https://hal.science/hal-05022776

INVITATIONS TO WORKSHOP AND CONFERENCES

Applied mathematics seminar *03/2025*
Laboratoire de Mathématiques Jean Leray, Nantes, France.

EWM-EMS Summer School: Kinetic Theory Arising from Math. Bio. *07/2024*
Institut Mittag-Leffler, Djursholm, Sweden.

PDE and numerical analysis seminar *05/2024*
Laboratoire J.A. Dieudonné, Nice, France.

Journées Jeunes EDPistes en France *03/2024*
Institut de Mathématiques de Toulouse, France.

Workshop on stability analysis for nonlinear PDEs *10/2023*
Departement of Math., Penn State, State College, USA.

Webinar of the French-Korean IRL in Mathematics *06/2023*
Happening virtually.

PDE seminar *03/2023*
IRMAR, Rennes, France.

SIAM Conference on Computational Science and Engineering *03/2023*
RAI Congress Centre, Netherland.

Seminario de Ecuaciones Diferenciales *02/2023*
Universidad de Granada, Spain.

RSME 2023 LEON *02/2023*
Universidad de Leon, Spain.

Kinetic and hyperbolic equations analysis, modeling and numerics *12/2022*
Insitut de Mathématiques de Toulouse, France.

2022 International Conference on Mathematical Neuroscience *07/2022*
Happening virtually.

Workshop ANR ChaMaNe *06/2022*
Île Rousse, France.

Frontiers in kinetic theory: connecting microscopic to macroscopic scales *05/2022*
Isaac Newton Institute, Cambridge, UK.

SIAM 2022 Conference on Analysis of Partial Differential Equations *03/2022*
Happening Virtually.

Asymptotic Behaviors of systems of PDEs arising in physics and biology *11/2021*
Polytech Lille, Villeneuve-d'Ascq, France.

Modèles et méthodes pour les équations cinétiques *10/2021*
Institut de Mathématiques de Bordeaux, Talence, France.

Kinetic Coffee *06/2021*
Happening virtually

SERVICE

Co-organizer of the Applied Analysis and Probability Seminar *2023 - present*
Pennsylvania State University

Co-organizer of the PDE doctoral seminar *2022 - 2023*
Institut de Mathématiques de Toulouse

Referee for:
- Multiscale Modeling and Simulation
- SIAM journal on scientific computing
- Discrete and Continuous Dynamical Systems - Series B

VISITING POSITIONS

Université Toulouse III *April - July 2020*
Visiting student
Advisor : Prof. Francis Filbet

University of Chicago *April - June 2018*
Visiting student
Advisor : Prof. Guillaume Bal

Institut Fourier *May - June 2017*
Visiting student
Advisor : Associate Prof. Pierre Dehornoy

TEACHING

Pennsylvania State University. *2023 - 2024*
*4 unit course (49*1.5 ∼ 73h eq. TD), calculus and analytic geometry II, spring semester.*
*4 unit course (49*1.5 ∼ 73h eq. TD), calculus and analytic geometry II, fall semester.*
Université Paul Sabatier. *2022 - 2023*
4h of pratictal works (Python), linear algebra, first year of BSc.
30h of tutorials, mathematics, first year of BSc.
Université Paul Sabatier. *2021 - 2022*
26h of lecture and tutorials, linear algebra, first year of BSc.
9h of pratictal works (Python), linear algebra, first year of BSc.
30h of tutorials, mathematics, first year of BSc.
Université Paul Sabatier. *2020 - 2021*
26h of lecture and tutorials, linear algebra, first year of BSc.
30h of tutorials, mathematics, first year of BSc.