

ALAIN BLAUSTEIN

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APPOINTMENTS

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|---|-----------------------|
| Research Scientist (Chargé de Recherche)
<i>Inria centre at the University of Lille in the team RAPSODI</i> | <i>2025 - Present</i> |
| S. Chowla Postdoctoral Research Assistant
<i>Pennsylvania State University</i> | <i>2023 - 2025</i> |

EDUCATION

- | | |
|--|--------------------|
| Ph.D. in Mathematics
<i>Université Toulouse III</i>
Advisor: Prof. Francis Filbet | <i>2020 - 2023</i> |
| M.S. and B.S. in Mathematics
<i>École Normale Supérieure de Rennes</i> | <i>2016 - 2020</i> |
| Agrégation externe de Mathématiques
<i>École Normale Supérieure de Rennes</i>
Major: Scientific Computing | <i>2018 - 2019</i> |

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/>

LIST OF PRE-PRINTS

- (1) **Derivation of the bacterial run-and-tumble kinetic model : quantitative and strong convergence results** 2023
<https://hal.science/hal-04336656/>

- (2) **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>

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

- (4) **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. <i>Institut Mittag-Leffler, Djursholm, Sweden.</i>	07/2024
PDE and numerical analysis seminar <i>Laboratoire J.A. Dieudonné, Nice, France.</i>	05/2024
Journées Jeunes EDPistes en France <i>Institut de Mathématiques de Toulouse, France.</i>	03/2024
Workshop on stability analysis for nonlinear PDEs <i>Department of Math., Penn State, State College, USA.</i>	10/2023
Webinar of the French-Korean IRL in Mathematics <i>Happening virtually.</i>	06/2023
PDE seminar <i>IRMAR, Rennes, France.</i>	03/2023
SIAM Conference on Computational Science and Engineering <i>RAI Congress Centre, Netherland.</i>	03/2023
Seminario de Ecuaciones Diferenciales <i>Universidad de Granada, Spain.</i>	02/2023
RSME 2023 LEON <i>Universidad de Leon, Spain.</i>	02/2023
Kinetic and hyperbolic equations analysis, modeling and numerics <i>Institut de Mathématiques de Toulouse, France.</i>	12/2022
2022 International Conference on Mathematical Neuroscience <i>Happening virtually.</i>	07/2022
Workshop ANR ChaMaNe <i>Île Rousse, France.</i>	06/2022
Frontiers in kinetic theory: connecting microscopic to macroscopic scales <i>Isaac Newton Institute, Cambridge, UK.</i>	05/2022
SIAM 2022 Conference on Analysis of Partial Differential Equations <i>Happening Virtually.</i>	03/2022
Asymptotic Behaviors of systems of PDEs arising in physics and biology <i>Polytech Lille, Villeneuve-d'Ascq, France.</i>	11/2021
Modèles et méthodes pour les équations cinétiques <i>Institut de Mathématiques de Bordeaux, Talence, France.</i>	10/2021
Kinetic Coffee <i>Happening virtually</i>	06/2021

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 practical 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 practical 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.