# ALAIN BLAUSTEIN

309 McAllister Building, State College, PA 16802 ⋄ akb7016@psu.edu

## EMPLOYEMENT

**S. Chowla Postdoctoral Research Assistant** *2023 - present*
*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.*

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

(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.*

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

(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.*

(6) **Concentration profiles in FitzHugh-Nagumo neural networks: A Hopf-Cole approach** *2024*
*Discrete and Continuous Dynamical Systems - B 29 (2024), no. 4, p. 2018-2042, with E. Bouin.*

## LIST OF PRE-PRINTS

(1) **Derivation of the bacterial run-and-tumble kinetic model : quantitative and strong convergence results** *2023*
*arXiv:2312.07121*

## INVITATIONS TO WORKSHOP AND CONFERENCES

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

**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

## PROGRAMMING SKILLS

**C++, Python, Matlab, Caml**

## TEACHING

**Pennsylvania State University.** *2023 - 2024*
*4 unit course (49*1.5 ∼ 73h eq. TD), calculus and analytic geometry II, sring 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.*