

# ALAIN BLAUSTEIN

309 McAllister Building, State College, PA 16802  $\diamond$  akb7016@psu.edu

## EMPLOYEMENT

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

## EDUCATION

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**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

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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

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- (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

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

## INVITATIONS TO WORKSHOP AND CONFERENCES

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- 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  
*Department 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  
*Institut de Mathématiques de Toulouse, France.*
- 2022 International Conference on Mathematical Neuroscience** 07/2022  
*Happening virtually.*

<b>Workshop ANR ChaMaNe</b> <i>Île Rousse, France.</i>	<i>06/2022</i>
<b>Frontiers in kinetic theory: connecting microscopic to macroscopic scales</b> <i>Isaac Newton Institute, Cambridge, UK.</i>	<i>05/2022</i>
<b>SIAM 2022 Conference on Analysis of Partial Differential Equations</b> <i>Happening Virtually.</i>	<i>03/2022</i>
<b>Asymptotic Behaviors of systems of PDEs arising in physics and biology</b> <i>Polytech Lille, Villeneuve-d'Ascq, France.</i>	<i>11/2021</i>
<b>Modèles et méthodes pour les équations cinétiques</b> <i>Institut de Mathématiques de Bordeaux, Talence, France.</i>	<i>10/2021</i>
<b>Kinetic Coffee</b> <i>Happening virtually</i>	<i>06/2021</i>

## SERVICE

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<b>Co-organizer of the Applied Analysis and Probability Seminar</b> <i>Pennsylvania State University</i>	<i>2023 - present</i>
<b>Co-organizer of the PDE doctoral seminar</b> <i>Institut de Mathématiques de Toulouse</i>	<i>2022 - 2023</i>
<b>Referee for:</b> - Multiscale Modeling and Simulation - SIAM journal on scientific computing - Discrete and Continuous Dynamical Systems - Series B	

## VISITING POSITIONS

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<b>Université Toulouse III</b> <i>Visiting student</i> Advisor : Prof. Francis Filbet	<i>April - July 2020</i>
<b>University of Chicago</b> <i>Visiting student</i> Advisor : Prof. Guillaume Bal	<i>April - June 2018</i>
<b>Institut Fourier</b> <i>Visiting student</i> Advisor : Associate Prof. Pierre Dehornoy	<i>May - June 2017</i>

## PROGRAMMING SKILLS

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

## TEACHING

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<b>Pennsylvania State University.</b>	<i>2023 - 2024</i>
<i>4 unit course (49*1.5 ~ 73h eq. TD), calculus, first year of BSc, spring semester.</i>	
<i>4 unit course (49*1.5 ~ 73h eq. TD), calculus, first year of BSc, fall semester.</i>	
<b>Université Paul Sabatier.</b>	<i>2022 - 2023</i>
<i>4h of practical works (Python), linear algebra, first year of BSc.</i>	
<i>30h of tutorials, mathematics, first year of BSc.</i>	
<b>Université Paul Sabatier.</b>	<i>2021 - 2022</i>
<i>26h of lecture and tutorials, linear algebra, first year of BSc.</i>	
<i>9h of practical works (Python), linear algebra, first year of BSc.</i>	
<i>30h of tutorials, mathematics, first year of BSc.</i>	
<b>Université Paul Sabatier.</b>	<i>2020 - 2021</i>
<i>26h of lecture and tutorials, linear algebra, first year of BSc.</i>	
<i>30h of tutorials, mathematics, first year of BSc.</i>	