

# ALAIN BLAUSTEIN

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

## RESEARCH EXPERIENCE

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**Postdoctoral Scholar/Research Assistant** *September 2023 - present*  
*Department of Mathematics, Pennsylvania State University, USA*

**Ph.D. program with Prof. Francis Filbet** *September 2020 - September 2023*  
*Institut de Mathématiques de Toulouse, France*

Subject : "Theoretical and numerical analysis of mean-field models arising in Physics and Biology".

Defense date: 26/06/2023

**Internship with Prof. Francis Filbet** *April-July 2020*  
*Institut de Mathématiques de Toulouse, France*

Subject : "Mean-field limit for a spatially extended FitzHugh-Nagumo neural network".

**Master thesis with Prof. Roger Lewandowski** *November 2018-January 2019*  
*Université Rennes 1, France*

Subject : "Well posedness of the incompressible Navier-Stokes equations on short times".

**Internship with Prof. Guillaume Bal** *April - June 2018*  
*University of Chicago, USA*

Subject : "Stochastic Homogenization of the Poisson equation with degenerated diffusion coefficients".

**Internship with M.d.C. Pierre Dehornoy** *May - June 2017*  
*Institut Fourier, Grenoble, France*

Subject : "Birkhoff sections of the geodesic flow in the torus".

## EDUCATION AND DEGREES

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**Graduated the French Agregation** *September 2018 - June 2019*  
*École Normale Supérieure, Rennes, France*

Major : "Scientific Computing".

**BSc and MSc in Fundamental Mathematics** *September 2016 - June 2020*  
*École Normale Supérieure, Rennes, France*

Graduated with high Honors.

**Post-Secondary prepatory classes**  
*Lycée Charlemagne, Paris, France*

*September 2014 - June 2016*

University-level courses required in preparation for competitive entrance exams into top engineering and graduate schools (France's "Grandes Écoles").

## 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** and **neuroscience**.

I focus on establishing links between the multiple scales inherent to these systems. Specifically, I have worked on longtime behaviors and hydrodynamic limits of these systems. I aimed, on the one hand, at proving theoretical results quantitatively bridging these regimes 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) **On a discrete framework of hypocoercivity for kinetic equations** 2024  
*AMS Math. Comp.* 93 (2024), no. 345, p. 163-202, with F. Filbet.
- (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) **Large coupling in a FitzHugh-Nagumo neural network: quantitative and strong convergence results** 2023  
*J. Differential Equations* 374 (2023), 218-266.
- (5) **Concentration profiles in FitzHugh-Nagumo neural networks: A Hopf-Cole approach** 2023  
*to appear in Discrete and Continuous Dynamical Systems Series B*, with E. Bouin.
- (6) **A structure and asymptotic preserving scheme for the Vlasov-Poisson-Fokker-Planck model** 2023  
*submitted to the Journal of Computational Physics*, with F. Filbet.

## INVITATIONS TO WORKSHOP AND CONFERENCES

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<b>Webinar of the French-Korean IRL in Mathematics</b> <i>Happening virtually.</i>	06/2023
<b>PDE seminar</b> <i>IRMAR, Rennes, France.</i>	03/2023
<b>SIAM Conference on Computational Science and Engineering</b> <i>RAI Congress Centre, Netherland.</i>	03/2023
<b>Seminario de Ecuaciones Diferenciales</b> <i>Universidad de Granada, Spain.</i>	02/2023
<b>RSME 2023 LEON</b> <i>Universidad de Leon, Spain.</i>	02/2023
<b>Kinetic and hyperbolic equations analysis, modeling and numerics</b> <i>Institut de Mathématiques de Toulouse, France.</i>	12/2022
<b>2022 International Conference on Mathematical Neuroscience</b> <i>Happening virtually.</i>	07/2022
<b>Workshop ANR ChaMaNe</b> <i>Île Rousse, France.</i>	06/2022
<b>Frontiers in kinetic theory: connecting microscopic to macroscopic scales</b> <i>Isaac Newton Institute, Cambridge, UK.</i>	05/2022
<b>SIAM 2022 Conference on Analysis of Partial Differential Equations</b> <i>Happening Virtually.</i>	03/2022
<b>Asymptotic Behaviors of systems of PDEs arising in physics and biology</b> <i>Polytech Lille, Villeneuve-d'Ascq, France.</i>	11/2020
<b>Models and Methods for kinetic equations</b> <i>Institut de Mathématiques de Bordeaux, Talence, France.</i>	10/2020

## ORGANIZING RESPONSABILITIES

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<b>Co-organizer of the PDE doctoral seminar</b> <i>Institut de Mathématiques de Toulouse.</i>	09/2022 - Present
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## PROGRAMMING SKILLS

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C++, Python, Matlab, Caml, Latex

## TEACHING

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<b>Pennsylvania State University.</b> <i>4 unit course (49*1.5 ~ 73h eq. TD), calculus, first year of BSc.</i>	2023 - 2024
<b>Université Paul Sabatier.</b> <i>4h of practical works (Python), linear algebra, first year of BSc.</i>	2022 - 2023

*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.*

## SKILLS

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<b>Language</b>	French (Native speaker), English (fluent)
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