

# Antoine DIEZ

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Born on May 14th, 1994 in Paris, Nationality: French



Since May 2022, I am a **Program Specific Researcher** (post-doc) at the Kyoto University Institute for the Advanced Study of Human Biology (**ASHBi**). I work in the *Mathematical Biology and Medicine Laboratory* led by Prof. Sungrim Seirin-Lee.

## (1) Curriculum Vitae

### Formation and employment

- 2022 – ... **Post-doc (*Program Specific Researcher*)**, *Kyoto University Institute for the Advanced Study of Human Biology (ASHBi)*, Kyoto, Japan  
within the *Mathematical Biology and Medicine Laboratory* led by Prof. Sungrim Seirin-Lee.
- 2018–2022 **PhD**, *Imperial College London*, London, UK
- Under the supervision of Prof. Pierre Degond (Imperial College London), Prof. Sara Merino-Aceituno (University of Vienna) and Dr. Amic Frouvelle (Université Paris-Dauphine).
  - EPSRC-Roth scholarship co-funded by the Department of Mathematics at Imperial College London and the Engineering and Physical Sciences Research Council.
  - Thesis title: *Multiscale derivation, analysis and simulation of collective dynamics models: geometrical aspects and applications*
  - Link: <https://doi.org/10.25560/96971>
- 2017–2018 **Master degree in Mathematics (MSc)**, *École Normale Supérieure*, Lyon, France  
*French “Master 2” (M2)*
- First class honours
  - Master project co-supervised by Prof. Pierre Degond (Imperial College London), Prof. Sara Merino-Aceituno (University of Vienna) and Dr. Amic Frouvelle (Université Paris-Dauphine).
- 2016–2017 **“Agrégation de mathématiques”**, *École Normale Supérieure/Université de Rennes 1*, Rennes, France  
*The French “Agrégation” is a highly selective competitive examination to become teacher with an expertise in all areas of Mathematics up to the Bachelor level.*  
(National) rank 10/305

- 2015–2016 **Master degree in Mathematics (1st year)**, *École Normale Supérieure/Université de Rennes 1*, Rennes, France  
*French "Maîtrise" (M1). In the French system, the Master degree is split into two years called M1 and M2.*
- First class honours (rank 3/56)
  - Two month internship at the University of Cambridge (UK) supervised by Prof. Clément Mouhot.  
 Title : *Around the Boltzmann-Grad limit*
- 2014–2016 **Bachelor degree in Physics**, *École Normale Supérieure/Université de Rennes 1*, Rennes, France  
 First class honours
- 2014–2015 **Bachelor degree in Mathematics**, *École Normale Supérieure/Université de Rennes 1*, Rennes, France
- First class honours (rank 2/108)
  - Internship at the University Paris-VI supervised by Dr. Corentin Audiard.  
 Title : *Asymptotic Solutions of the Quadratic Nonlinear Schrödinger Equation*
- 2012–2014 **French "classes préparatoires" (MPSI and MP\*)**, *Lycée Louis-le-Grand*, Paris, France  
*Two years of intensive course in Mathematics and Physics leading to a national competitive examination to be allowed to enrol in one of the French top-level "grandes écoles".*  
 Recruited (French "normalien", civil servant position) at the *École Normale Supérieure de Rennes (ENS Rennes)*.
- 2009–2012 **High school**, *Lycée Louis-le-Grand*, Paris, France

## Teaching and supervision

- May-July **Supervision**, *AHSBi*, Kyoto, Japan  
 2023 Co-supervision of the Master internship of a student from ENS Rennes (France).
- 2018-2020 **Supervision**, *Imperial College London*, London, UK  
 Co-supervision of 5 MSc projects (2 from outside Imperial), main supervisor: Pierre Degond
- 2019-2020 **Graduate Teaching Assistant**, *Imperial College London*, London, UK, Non-linear Waves (2nd year), Function spaces and applications (3rd and 4th years), Advanced topics in Partial Differential Equations (3rd and 4th years)  
 Demonstration (exercice class), Coursework marking
- 2018-2019 **Graduate Teaching Assistant**, *Imperial College London*, London, UK, Analysis I and II (1st and 2nd years)  
 Demonstration (exercice class), Coursework marking.
- 2017-2018 **"Khôlleur"**, *Lycée du Parc*, Lyon, France  
 Weekly oral examination in French "classe préparatoire" (MP, 2nd year)
- 2016-2017 **"Khôlleur"**, *Lycée Chateaubriand*, Rennes, France  
 Weekly oral examination in French "classe préparatoire" (MP, 2nd year)

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## Invited Talks

- Jul. 2024 **Joint annual meeting of the Korean Society for Mathematical Biology and the Society for Mathematical Biology**, *Konkuk University*, Seoul, South Korea  
Talk at the minisymposium “Modeling, Simulation, and Control of Individual and Multicellular Migration” organised by S. Plunder and G. M. Molina Angeles
- Jun. 2024 **KU – UNIVIE Joint Symposium on Global Health**, *The University of Vienna*, Vienna, Austria
- Jun. 2024 **ReaDiNet Workshop on Reaction-Diffusion Systems and Population Dynamics**, *VVF Montpeyroux*, Parent, France
- Mar. 2024 **MATRIX-RIMS Tandem Workshop on Evolutionary Partial Differential Equations and Applications**, *Kyoto University*, Kyoto, Japan
- Mar. 2024 **Workshop 非線形現象の数値シミュレーションと解析 2024**, *Hokkaido University*, Sapporo, Japan
- Feb. 2024 **Workshop Bio-PDE days Vienna**, *TU Wien*, Vienna, Austria
- Jan. 2024 **Seminar**, *French-Japanese Laboratory of Mathematics and its Interactions*, The University of Tokyo, Japan
- Nov. 2023 **Seminar**, *Department of Mathematics*, Kanazawa University, Japan
- Oct. 2023 **International Conference on Recent Developments of Theory and Methods in Mathematical Biology**, *NCTS*, Taipei, Taiwan, Organized by the International Research Network “ReadiNet”.  
Poster presentation
- Aug. 2023 **ICIAM**, *Waseda University*, Tokyo, Japan  
Talk at the mini-symposium “Mathematics in biological pattern formation: modeling, analysis, and applications” organised by S.-I. Ei and H. Ishii
- Jun. 2023 **Summer School - Mean-Field Models**, *Centre Henri Lebesgue, IRMAR*, Rennes, France  
Invited Lecture on “Introduction to Propagation of Chaos and Mean-Field models”
- Mar. 2023 **ASHBi Retreat**, *Arima Grand Hotel*, Arima Onsen, Japan
- Mar. 2023 **Mathematical Society of Japan Spring Meeting**, *Chuo University*, Tokyo, Japan
- Feb. 2023 **Methods and Applications in Mathematical Life Sciences 変革 A:  $3G+\infty$ (無限) Fusion Meeting**, *ASHBi*, Kyoto, Japan
- Feb. 2023 「データ記述科学」 **Henkaku A meeting**, *Institute of Statistical Sciences*, Tokyo, Japan
- Dec. 2022 **Kyoto-Vienna biomath workshop**, *Erwin Schrödinger Institute*, Vienna, Austria
- Sep. 2022 **JSIAM Annual Meeting**, *Hokkaido University*, Sapporo, Japan

- Jun. 2022 **Kyoto University Applied Mathematics Seminar**, *Department of Mathematics*, Kyoto University, Japan
- Jun. 2022 **PDE and Numerical Analysis Seminar**, *Laboratoire J.A. Dieudonné*, Nice, France, (online)
- Dec. 2021 **Workshop MaMoVi**, *École Polytechnique*, Palaiseau, France
- Nov. 2021 **Conference “Asymptotic Behaviors of systems of PDEs arising in physics and biology - 4th edition”**, *Polytech*, Lille, France
- Oct. 2021 **Conference “Non-Local Models Arising from Biology”**, *CIRM*, Marseille, France  
Poster presentation
- Feb. 2021 **PhD Seminar**, *Laboratoire Jacques-Louis Lions*, UPMC, Paris, France
- Mar. 2020 **Workshop of the Royal Society - CNRS international exchange grant ‘Segregation models in social sciences’**, *INRIA Paris*, France
- Dec. 2019 **CAKE seminar**, *University of Cambridge*, UK  
Seminar organized by the graduate students and post-docs of the Cambridge Center for Analysis
- Oct. 2019 **Ki-Net Young Researchers Workshop**, *CSCAMM*, *University of Maryland*, USA
- Nov. 2018 **Workshop of the Royal Society - CNRS international exchange grant ‘Segregation models in social sciences’**, *Imperial College London*, UK

## Research stays

- Dec. 2022 **Wolfson Centre for Mathematical Biology**, *University of Oxford*, UK, One-week research stay hosted by the group of Prof. Philip Maini and Prof. Eamonn Gaffney.
- Nov. 2022 & **Erwin Schrödinger Institute**, *Vienna*, Austria, Two-week research stay  
Dec. 2022 hosted by Prof. Sara Merino-Aceituno during the thematic programme “Mathematical Methods for the Study of Self-organization in the Biological Sciences”.  
Funded by the KU-UNIVIE Joint Grant program.
- Feb. 2022 & **Institut de mathématiques de Toulouse**, *Toulouse*, France, Research stays  
April 2022 hosted by Prof. Pierre Degond  
July 2021 **Institut de mathématiques de Toulouse**, *Toulouse*, France, One-week research stay hosted by Prof. Pierre Degond
- Oct.-Nov. **CSCAMM, University of Maryland**, USA, Four-week research stay hosted  
2019 by Prof. Pierre-Emmanuel Jabin  
Funded by the Ki-Net network
- April 2019 **CEREMADE, Université Paris Dauphine**, *Paris*, France, One-month research stay hosted by Dr. Amic Frouvelle
- Dec. 2018 **University of Vienna**, *Vienna*, Austria, One-week research stay, invited by Prof. Sara Merino-Aceituno

- April-July **Université Paris Dauphine (France), Imperial College London (UK)**  
2018 **and University of Sussex (UK)**, Four month internship supervised by Prof. Pierre Degond, Prof. Sara Merino-Aceituno and Dr. Amic Frouvelle  
Master thesis title: *Body-orientation dynamics, particle models, phase transitions and macroscopic models*  
Partially funded by an Erasmus+ grant of the European Union
- May-June **University of Cambridge, Cambridge, UK**, Two-month internship supervised  
2016 by Prof. Clément Mouhot  
M1 thesis title: *Around the Boltzmann-Grad limit*  
Partially funded by an Erasmus+ grant of the European Union
- May-June **Université Paris VI, Paris, France**, One-month internship supervised by Dr.  
2015 Corentin Audiard  
Bachelor thesis title: *Asymptotic Solutions of the Quadratic Nonlinear Schrödinger Equation*

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## Fundings and grants

- 2023-2025 **ASHBi Fusion Grant**, *Building a unifying theoretical and experimental framework of 2½D and 3D cellular and molecular mechanisms for self-organization of limb morphogenesis.*, Project representative: Dr. R. Tsutsumi, co-investigator with Dr. S. Plunder  
¥5,000,000
- 2023 - 2027 **KAKENHI Grant-in-Aid for Early-Career Scientists**, *Mechanical modes of cell migration in fiber networks*, Project Number 23K13015, PI  
¥4,290,000 (Direct Cost: ¥3,300,000, Indirect Cost: ¥990,000)
- 2022 **KU-UNIVIE Joint Grant Program**, *Mathematical models of emergence and dynamics of natural networks*, with Prof. S. Seirin-Lee and Prof. S. Merino-Aceituno  
¥1,000,000 from July 2022 to early March 2023  
Cooperation between Kyoto University (KU) and the University of Vienna (UNIVIE) in the framework of their Strategic Partnership established in 2019. Main achievement: co-organization of an international workshop at the Erwin Schrödinger Institute (Vienna) during the thematic program “Mathematical Methods for the Study of Self-organization in the Biological Sciences”.
- 2020 **Imperial-CNRS grant**, *A Global Approach on Sampling Problems for Imaging (GASPI)*  
£7,000 for one year  
I co-coordinated a French-UK project between mathematicians, statisticians and computer scientists to work on medical imaging problems.  
Due to the COVID-19 outbreak, the project had unfortunately to be cancelled

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## Scholarships

- 2018 **PhD scholarship**, *EPSRC-Roth scholarship co-funded by the Department of Mathematics at Imperial College London and the Engineering and Physical Sciences Research Council*
- 2018 **Erasmus+ grant of the European Union**, *Partial funding for an internship at Imperial College London and the University of Sussex (UK)*
- 2016 **Erasmus+ grant of the European Union**, *Partial funding for an internship at the University of Cambridge (UK)*
- 2014 **Received “Normalien” at the École Normale Supérieure de Rennes**, *Four-year studies fully funded (equivalent to a scholarship) by the French state (officially civil servant position)*

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## Organisation of workshops and research meetings

- Dec. 2023 **International workshop on Mathematical Biology**, ASHBi, Kyoto, Japan,  
Title: Development across scales  
Co-organized with S. Plunder (ASHBi), S. Seirin-Lee (ASHBi)

- Feb. 2023 **Fusion Meeting between 3 Henkaku A groups**, ASHBi, Kyoto, Japan,  
Title: *Methods and Applications in Mathematical Life Sciences*  
Co-organized with H. Ishii (ASHBi) and C. Moreau (RIMS)
- Dec. 2022 **Kyoto-Vienna biomath workshop**, Erwin Schrödinger Institute, Vienna,  
Austria  
Co-organized with S. Merino-Aceituno (Vienna) and S. Seirin-Lee (ASHBi)
- Sep. 2022 **Mini-symposium at JSIAM Annual Meeting**, Hokkaido University, Sapporo, Japan, Title: *Mathematics of emergent and evolution phenomena in complex systems* (複雑系における発生・発展現象の数理)  
Co-organized with H. Ishii (ASHBi)

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## Miscellaneous

Reviewer for the journals: *Journal of Nonlinear Science*, *Communications in Partial Differential Equations*, *Kinetic and Related Models*, *Multiscale Modeling and Simulation*, *Annals of Applied Probability*, *Electronic Communications in Probability*, *Journal of Mathematical Biology*, *Scientific Reports*.

Programming skills: Python, Julia, MATLAB

Languages: French, English (fluent), Japanese (basic) (事務と日本語でのメールやり取り可能簡単な一般会話可能)

## (2) Publications and preprints

All the author lists are sorted in alphabetical order except when indicated by †.

All the publications and preprints in this list have been submitted to peer-reviewed journals.

### Published articles (peer-reviewed)

- [1] P. Degond, A. Diez, A. Frouvelle, and S. Merino-Aceituno. “Phase Transitions and Macroscopic Limits in a BGK Model of Body-Attitude Coordination”. *J. Nonlinear Sci.* 30.6 (2020), pp. 2671–2736. DOI: 10.1007/s00332-020-09632-x.
- [2] A. Diez. “Propagation of Chaos and Moderate Interaction for a Piecewise Deterministic System of Geometrically Enriched Particles”. *Electron. J. Probab.* 25 (2020), pp. 1–38. DOI: 10.1214/20-EJP496.
- [3] M. Briant, A. Diez, and S. Merino-Aceituno. “Cauchy Theory and Mean-Field Limit for General Vicsek Models in Collective Dynamics”. *SIAM J. Math. Anal.* 54.1 (2021), pp. 1131–1168. DOI: 10.1137/21M1405885.
- [4] P. Degond, A. Diez, and M. Na. “Bulk Topological States in a New Collective Dynamics Model”. *SIAM J. Appl. Dyn. Syst.* 21.2 (2021), pp. 1455–1494. DOI: 10.1137/21M1393935.
- [5] A. Diez. “SiSyPHE: A Python Package for the Simulation of Systems of Interacting Mean-Field Particles with High Efficiency”. *Journal of Open Source Software* 6.65 (2021), p. 3653. DOI: 10.21105/joss.03653. URL: <https://sisyphe.readthedocs.io/>.
- [6] L.-P. Chaintron and A. Diez. “Propagation of Chaos: A Review of Models, Methods and Applications. I. Models and Methods”. *Kinet. Relat. Models* 15.6 (2022), pp. 895–1015. DOI: 10.3934/krm.2022017.
- [7] L.-P. Chaintron and A. Diez. “Propagation of Chaos: A Review of Models, Methods and Applications. II. Applications”. *Kinet. Relat. Models* 15.6 (2022), pp. 1017–1173. DOI: 10.3934/krm.2022018.
- [8] G. Clarté, A. Diez, and J. Feydy. “Collective Proposal Distributions for Nonlinear MCMC Samplers: Mean-Field Theory and Fast Implementation”. *Electron. J. Statist.* 16.2 (2022), pp. 6395–6460. DOI: 10.1214/22-EJS2091.
- [9] P. Degond, A. Diez, and A. Walczak. “Topological States and Continuum Model for Swarmalators without Force Reciprocity”. *Anal. Appl. (Singap.)* 20.6 (2022), pp. 1215–1270. DOI: 10.1142/S0219530522400073.
- [10] P. Degond and A. Diez. “Topological Travelling Waves of a Macroscopic Swarmalator Model in Confined Geometries”. *Acta Appl. Math.* 188.18 (2023). DOI: 10.1007/s10440-023-00628-9.
- [11] A. Diez<sup>†</sup>, A. L. Krause, P. K. Maini, E. A. Gaffney, and S. Seirin-Lee. “Turing Pattern Formation in Reaction-Cross-Diffusion Systems with a Bilayer Geometry”. *Bull. Math. Biol.* 86.13 (2024). DOI: 10.1007/s11538-023-01237-1.



## Preprints

- [12] P. Degond, A. Diez, and A. Frouvelle. “Body-Attitude Coordination in Arbitrary Dimension”. *arXiv preprint: arXiv:2111.05614* (2021).
- [13] A. Diez and J. Feydy. “An optimal transport model for dynamical shapes, collective motion and cellular aggregates”. *arXiv preprint: arXiv:2402.17086* (2024). URL: <https://iceshot.readthedocs.io/>.

The full list of publications (with a citation count) is also available on my Google Scholar profile: <https://scholar.google.com/citations?user=yjyCJZUAAAAJ>