Matthieu Mangeat, PhD

Born on June 21, 1991 in Nancy (France)

Rue Nationale, 57600 Forbach

mangeat@lusi.uni-sb.de

admin@mangeatm.fr

Professional Skills

Scientific research area: Nonequilibrium statistical physics (dispersion of particles in complex media, optical trapping of nanoparticles, sedimentation of active matter, and flocking dynamics of active spins), applications of statistical physics to biology (search strategies, first passage times, intracellular transport, and cytoskeleton organization), glass transition and disordered systems.

Technics: Analytical solutions of physical problems, numerical solutions of equations with the finite elements method (with FreeFem++), and numerical simulations of stochastic and molecular dynamics (with C++ and OpenMP).

Languages: French (mother tongue), English (fluent), Spanish and Basque (basics).

Computer languages: C, C++, OpenMP, MPI, python, shell, html, PHP.

Scientific softwares: Mathematica, Maple, Gnuplot, FlexPDE, FreeFem++, Zotero.

Other softwares: LibreOffice, LaTeX, Beamer, Inkscape.

Education

25/09/2018	**PhD thesis at the University of Bordeaux in Physics (Laser, matter and nanoscience).**
2016	"Teaching Through Teaching" program at the University of Bordeaux.
2015-2018	PhD student at the University of Bordeaux supervised by David S. Dean and Thomas Guérin.
2015	**Diploma of the École Normale Supérieure.**
2013-2015	Master student in Theoretical Physics ENS-ICFP at the École Normale Supérieure, Paris, France.
2012-2013	Bachelor student in Physics at the École Normale Supérieure, Paris, France.
2009-2012	Classe Préparatoire aux Grandes Écoles (intensive courses equivalent to Bachelor's two first years) Physics and Chemistry, at Lycée René Cassin, Bayonne, France.
2009	**Baccalauréat S** (equivalent to A levels in Mathematics, Physics, and Chemistry).

Professionnal Experience

2018-2024	**Postdoc** in the group of H. Rieger at Saarland University, Saarbrücken, Germany. Research work on the sedimentation of active matter, flocking dynamics of active spins, and intracellular transport times, participation in writing the lecture notes, and group webpage manager.
2015-2018	**PhD in physics**, *From dispersion to Brownian vortices in out-of-equilibrium confined systems*, supervised by D. S. Dean et T. Guérin at Laboratoire Ondes et Matière d'Aquitaine, University of Bordeaux. Research work on the dispersion of particles in complex media and the optical trapping of nanoparticles, and teaching assistant at the University of Bordeaux during the third year.
01-03/2015	**Second-year Master's internship**, *Approximation schemes for the glass transition in simple systems*, supervised by F. Zamponi at Laboratoire de Physique Théorique, École Normale Supérieure, Paris.
02-07/2014	**First-year Master's internship**, *Kinetic Monte Carlo studies of Reaction-Diffusion systems*, supervised by H. Rieger and K. Schwarz at Saarland University, Saarbrücken, Germany.
07/2013	**Third-year Bachelor's internship**, *Faraday instability - Scattering of an acoustic wave on the air-liquid interface*, supervised by S. Fauve at Laboratoire de Physique Statistique, École Normale Supérieure, Paris.

Other Qualifications

Driving licence since the 22nd of October 2010.

Scientific Publications

[21] S. Chatterjee, M. Karmakar, **M. Mangeat**, H. Rieger, and R. Paul, *Stability of discrete-symmetry flocks: sandwich state, traveling domains and motility-induced pinning*, Phys. Rev. E **112**, 064115 (2025), `arXiv:2507.08187`.

[20] A. K. Dutta, **M. Mangeat**, H. Rieger, R. Paul, and S. Chatterjee, *Stability of flocking in the reciprocal two-species Vicsek model: Effects of relative population, motility, and noise*, Phys. Rev. E **112**, 024137 (2025), `arXiv:2504.13709`.

[19] **M. Mangeat**, S. Chatterjee, J. D. Noh, and H. Rieger, *Emergent complex phases in a discrete flocking model with reciprocal and non-reciprocal interactions*, Commun. Phys. **8**, 186 (2025), `arXiv:2412.02501`.

[18] **M. Mangeat**, S. Chakraborty, A. Wysocki, and H. Rieger, *Stationary particle currents in sedimenting active matter wetting a wall*, Phys. Rev. E **109**, 014616 (2024), `arXiv:2309.09714`.

[17] M. Karmakar, S. Chatterjee, **M. Mangeat**, H. Rieger, and R. Paul, *Jamming and flocking in the restricted active Potts model*, Phys. Rev. E **108**, 014604 (2023), `arXiv:2212.10251`.

[16] S. Chatterjee, **M. Mangeat**, C.-U. Woo, H. Rieger, and J. D. Noh, *Flocking of two unfriendly species: The two-species Vicsek model*, Phys. Rev. E **107**, 024607 (2023), `arXiv:2211.10494`.

[15] S. Chatterjee, **M. Mangeat**, and H. Rieger, *Polar flocks with discretized directions: the active clock model approaching the Vicsek model*, EPL **138**, 41001 (2022), `arXiv:2203.01181`.

[14] A. Alexandre, **M. Mangeat**, T. Guérin, and D. S. Dean, *How Stickiness Can Speed Up Diffusion in Confined Systems*, Phys. Rev. Lett. **128**, 210601 (2022), `arXiv:2112.05532`.

[13] **M. Mangeat**, T. Guérin, and D. S. Dean, *Steady state of overdamped particles in the non-conservative force field of a simple non-linear model of optical trap*, J. Stat. Mech. **2021**, 113205 (2021), `arXiv:2110.04362`.

[12] **M. Mangeat** and H. Rieger, *Narrow escape problem in two-shell spherical domains*, Phys. Rev. E **104**, 044124 (2021), `arXiv:2104.13125`.

[11] **M. Mangeat**, S. Chatterjee, R. Paul, and H. Rieger, *Flocking with a q-fold discrete symmetry: band-to-lane transition in the active Potts model*, Phys. Rev. E **102**, 042601 (2020), `arXiv:2007.14875`.

[10] S. Chatterjee, **M. Mangeat**, R. Paul, and H. Rieger, *Flocking and re-orientation transition in the 4-state active Potts model*, EPL **130**, 66001 (2020), `arXiv:1911.13067`.

[9] **M. Mangeat**, T. Guérin, and D. S. Dean, *Effective diffusivity of Brownian particles in a two dimensional square lattice of hard disks*, J. Chem. Phys. **152**, 234109 (2020), `arXiv:2111.04354`.

[8] **M. Mangeat** and H. Rieger, *The narrow escape problem in a circular domain with radial piecewise constant diffusivity*, J. Phys. A: Math. Theor. **52**, 424002 (2019), `arXiv:1906.06975`.

[7] **M. Mangeat**, Y. Amarouchene, Y. Louyer, T. Guérin, and D. S. Dean, *Role of nonconservative scattering forces and damping on Brownian particles in optical traps*, Phys. Rev. E **99**, 052107 (2019), `arXiv:1812.09188`.

[6] Y. Amarouchene, **M. Mangeat**, B. Vidal Montes, L. Ondic, T. Guérin, D. S. Dean, and Y. Louyer, *Nonequilibrium Dynamics Induced by Scattering Forces for Optically Trapped Nanoparticles in Strongly Inertial Regimes*, Phys. Rev. Lett. **122**, 183901 (2019), `arXiv:1812.06804`.

[PhD] **M. Mangeat**, De la dispersion aux vortex browniens dans des systèmes hors-équilibres confinés, Thèse de doctorat, Université de Bordeaux (soutenue le 25 Septembre 2018).

[5] **M. Mangeat**, T. Guérin, and D. S. Dean, *Dispersion in two-dimensional periodic channels with discontinuous profiles*, J. Chem. Phys. **149**, 124105 (2018), `arXiv:1807.05366`.

[4] **M. Mangeat**, T. Guérin, and D. S. Dean, *Dispersion in two dimensional channels — the Fick-Jacobs approximation revisited*, J. Stat. Mech. **2017**, 123205 (2017), `arXiv:1710.02699`.

[3] **M. Mangeat**, T. Guérin, and D. S. Dean, *Geometry controlled dispersion in periodic corrugated channels*, EPL **118**, 40004 (2017), `arXiv:1709.03722`.

[2] X. Zhou, R. Zhao, K. Schwarz, **M. Mangeat**, E. C. Schwarz, M. Hamed, I. Bogeski, V. Helms, H. Rieger, and B. Qu, *Bystander cells enhance NK cytotoxic efficiency by reducing search time*, Scientific Reports **7**, 44357 (2017).

[1] **M. Mangeat** and F. Zamponi, *Quantitative approximation schemes for glasses*, Phys. Rev. E **93**, 012609 (2016), `arXiv:1510.03808`.

Author metrics

Scientific Conferences and Seminars

[16] The 29th international conference on Statistical Physics (StatPhys29), Florence (Italie), Juillet 2025, *Emergent phases in a discrete flocking model with non-reciprocal interaction* [Poster].

[15] DPG Meeting of the Condensed Matter Section - Regensburg 2025 (University of Regensburg, Germany), March 2025, *Emergent phases in a discrete flocking model with reciprocal interaction* [Talk].

[14] DPG Meeting of the Condensed Matter Section - Berlin 2024 (TU Berlin, Germany), March 2024, *Flocking of two unfriendly species* [Poster], and *Stationary particle currents in sedimenting active matter wetting a wall* [Talk].

[13] DPG Meeting of the Condensed Matter Section - Dresden 2023 (TU Dresden, Germany), March 2023, *Wetting of reflecting plates by an active Brownian fluid* [Poster], and *Polar flocks with discretized directions: the active clock model approaching the Vicsek model* [Talk].

[12] DPG Meeting of the Condensed Matter Section - Regensburg 2022 (University of Regensburg, Germany), September 2022, *Polar flocks with discretized directions: the active clock model approaching the Vicsek model* [Poster].

[11] Virtual DPG Spring Meeting 2021, March 2021, *The narrow escape problem in two-shell circular domains* [Poster], and *Flocking and reorientation transition in the q-state active Potts model* [Poster].

[10] Seminar at the Laboratoire de Physique Théorique et Modèles Statistiques (Orsay, France, online), January 2021, *Flocking and reorientation transition in the q-state active Potts model* [Talk].

[9] Seminar at the Laboratoire de Physique Théorique (Toulouse, France, online), Décembre 2020, *Flocking and reorientation transition in the q-state active Potts model* [Talk].

[8] Microswimmers International Conference 2020: Motile Active Matter au Forschungszentrum caesar (Bonn, Germany, online), October 2020, *Flocking and reorientation transition in the q-state active Potts model* [Poster].

[7] Frontiers in Computational Methods for Active Matter at the Centre Européen de Calcul Atomique et Moléculaire (Lausanne, Switzerland), February 2020, *Flocking and reorientation transition in the 4-state active Potts model* [Poster].

[6] Cell Physics 2019 at Saarland University (Saarbrücken, Germany), October 2019, *The narrow escape problem in a circular domain with radial piecewise constant diffusivity* [Talk].

[5] DPG Spring Meeting - Regensburg 2019 (University of Regensburg, Germany), April 2019, *Controlled dispersion in periodic microchannels and regular obstacle parks* [Talk].

[4] LOMA Theory Day 2018 (Talence, France), May 2018, *Geometry controlled dispersion in periodic channels* [Talk].

[3] Seminar at Saarland University (Saarbrücken, Germany), April 2018, *Geometry controlled dispersion in periodic channels* [Talk].

[2] Journées de Physique Statistique 2018 at the ESPCI (Paris, France), January 2018, *Dispersion in periodic channels* [Talk].

[1] International Summer School "Fundamental Problems in Statistical Physics XIV" at Bruneck (Italy), July 2017, *Geometry controlled dispersion in periodic corrugated channels* [Poster].

Teaching

2021   Advanced Quantum Mechanics (lecture notes).

2018   Teaching assistant (PhD contract) at the University of Bordeaux for 64 hours:
- Electromagnetism and Electronics practical sessions (11.33 hours).
- Fluid Mechanics practical sessions (12 hours).
- Physics practical sessions for Earth Sciences (24 hours).
- Methodology, Sciences part (18.67 hours): The Poster, A Medium for Scientific Communication.

2016   Teaching supervised by D. S. Dean at the University of Bordeaux for 24 hours, as part of the "Teaching Through Teaching" program.
- Fluid Mechanics practical sessions (12 hours).
- Tutorials of Mathematics for Representing Physical Phenomena (12 hours).