

Julien BOUVARD

Personal Data

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Research interests

I have a strong interest in hydrodynamics and microfluidics, especially its use to better understand microorganisms. My experience with bacteria during my PhD and with different eukaryotic unicellular organisms (swimming microalgae, gliding diatoms, excavates *etc.*) during my postdocs, has led me to carefully observe and analyse their behaviours. I am particularly interested in further studying the interactions of such motile microorganisms with their environment.

Research

Nov. 2024-	Postdoctoral Research Fellow in BIOFLUIDICS PI: Kirsty WAN at the Living Systems Institute, University of Exeter , Exeter, United Kingdom Projects: “Intelligent behaviour of eukaryotic unicellular organisms” One project is in collaboration with the groups of Alastair Simpson (Dalhousie University, Halifax, Canada) and Thomas Kiørboe (DTU, Copenhagen, Denmark), funded by HFSP.
2022-2024	Postdoctoral Research Associate in MICRO & BIOFLUIDICS PI: G. AMSELEM at LadHyX, Institut Polytechnique de Paris , Palaiseau, France Projects: “Erosion of microfluidic channels” & “Transport of particles by microalgae” Including a 2-month stay in Karen Alim’s group in TUM (Munich, Germany)
2018-2022	Ph.D. in FLUID MECHANICS Advisors: H. AURADOU and F. MOISY at FAST Laboratory, Université Paris-Saclay , Orsay, France Thesis: “ Dynamics of bacterial suspensions, from aerotaxis to cluster formation ”
2016-2018	MASTER of SCIENCE, APPLIED (M.Sc.A.) Advisors: S. ÉTIENNE and J. VÉTEL in MECHANICAL ENGINEERING at Polytechnique Montréal , Montréal, Canada Thesis: “ Study of the injection of air bubbles in a water flow ”
2013-2016	INTERNSHIPS: 5 months at FAST (Université Paris-Sud, Orsay, France) Advisor: Frédéric MOISY 2 months in R&D at Takasago (Hiratsuka, Japan) Advisor: Kenji MARUYAMA 6 months at Direction Générale de l’Armement (DGA) (Scientific department of the French Army, Val-de-Reuil, France) Advisors: R. LUQUET and S. BOURDON

Education

2018-2022	Ph.D. in FLUID MECHANICS at FAST Laboratory, Université Paris-Saclay , Orsay, France
2016-2018	MASTER of SCIENCE, APPLIED (M.Sc.A.) in MECHANICAL ENGINEERING at Polytechnique Montréal , Montréal, Canada
2013-2018	ENGINEERING DEGREE at École Polytechnique , Palaiseau, France Formation in Physics, Mechanics and Chemistry Major: FLUID MECHANICS
2010-2013	Preparatory classes at Lycée du Parc , Lyon Competitive courses in Physics, Mathematics & Chemistry

Publications

* denotes equal contribution

[P3] **J. Bouvard**, K. G. Bondoc-Naumovitz, K. Wan, Wavelength-dependent photokinetic behaviour in gliding diatoms (2026), *in preparation*.

[P2] **J. Bouvard**, S. Bentley, K. Wan, Transitions in motility and foraging behaviour in excavates (2026), *in preparation*.

[P1] A. Gargasson, **J. Bouvard**, C. Douarche, P. Mergaert, H. Auradou, Optimising the 3-channel microfluidic system to investigate chemical gradient impacts on bacterial chemotaxis in fluid and near surfaces (2025), *arXiv*, arXiv:2511.09534 [Preprint](#).

[6] T. Laroussi*, **J. Bouvard***, É. Jambon-Puillet, M. Jarrahi, G. Amselem, Controlling the collective transport of large passive particles with suspensions of microorganisms (2026), *Small* - in press. [Preprint](#).

[5] **J. Bouvard***, S. Basu*, C. Leu, O. Bektas, J.O. Rädler, G. Amselem, K. Alim, Self-organized homogenization of flow networks, *Phys. Rev. X*, vol. 15, no 4, p. 041038 (2025). [DOI](#)

[4] **J. Bouvard**, F. Moisy and H. Auradou, Ostwald-like ripening in the two-dimensional clustering of passive particles induced by swimming bacteria, *Phys. Rev. E*, vol. 107, no 4, p. 044607 (2023). [DOI](#)

[3] **J. Bouvard**, C. Douarche, P. Mergaert, H. Auradou and F. Moisy, Direct measurement of the aerotactic response in a bacterial suspension, *Phys. Rev. E*, vol. 106, no 3, p. 034404 (2022). [DOI](#) [Editor's suggestion](#)

[2] F. Moisy, **J. Bouvard** and W. Herreman, Counter-rotation in an orbitally shaken glass of beer, *EPL (Europhysics Letters)*, vol. 122, no 3, p. 34002 (2018). [DOI](#) [EPL Highlight](#)

[1] **J. Bouvard**, W. Herreman and F. Moisy, Mean mass transport in an orbitally shaken cylindrical container, *Phys. Rev. Fluids*, vol. 2, no. 8, p. 084801 (2017). [DOI](#)

International conferences

(upcoming in June 2026) Wavelength-dependent photokinetic behaviour in gliding diatoms
Microscale Ocean Biophysics 2026, Cargèse, Corsica, France.

Controlled transport of passive beads by phototactic swimming microorganisms
APS March Meeting 2024, Minneapolis, MN, USA. [Abstract](#)

Adaptive networks: erosion of microfluidic channels
APS March Meeting 2024, Minneapolis, MN, USA. [Abstract](#)

Transport of passive beads by random and directed motion of swimming micro-organisms
PHYMOT 2023, Würzburg, Germany.

Self-similar clustering of beads in a bacterial suspension
APS March Meeting 2022, Chicago, IL, USA. [Abstract](#)
APS DFD 2021, Phoenix, AZ, USA. [Abstract](#)

Aerotactic response of bacteria: experimental characterization at the bacteria and population scale
APS March Meeting 2022, Chicago, IL, USA. [Abstract](#)
APS DFD 2021, Phoenix, AZ, USA. [Abstract](#)

Motility and aerotaxis in *Sinorhizobium meliloti*, a soil bacterium
ICTAM 2020+1, virtual. [Abstract](#)

Characterization of bubble cloud quality and evolution using optical probes
IAHR 2018, Kyoto, Japan. [DOI](#)

Workshops & Posters

Motility and morphology of excavates
Origins of Excitability 2025, Heidelberg, Germany (poster)
Physics of Life & Maths of Life Mini-Symposium 2025, Exeter, UK (poster).

Flow homogenisation in adaptive microfluidic networks
IUTAM 2025, Manchester, United Kingdom (poster).

Microswimmers to displace large particles
Motile Active Matter 2024, Bonn, Germany (poster).

Homogenization of fluidic networks by erosion

Yves Couder Meeting 2024, Paris, France (poster).

Controlled transport of passive beads by phototactic swimming microorganisms

Fluid & Elasticity 2024, Arcachon, France (poster).

MICROBES Symposium by young researchers 2024, Orsay, France (poster).

Adaptive networks: erosion of microfluidic channels

GDR MicroNanoFluidique 2023, Lyon, France (poster).

Clustering dynamics of passive particles induced by swimming bacteria

Journées de Physique Statistique 2023, Paris, France.

PHYMOT 2022, Paris, France (poster).

When bacteria play marbles

RNL 2022, Paris, France (poster).

Journée Système et Matière Complexes 2021, Orsay, France.

Aerotaxis in *Sinorhizobium meliloti*, a soil bacterium

JDFP 2020, Orsay, France.

Motility and aerotaxis in *Sinorhizobium meliloti*, a soil bacterium

CMiF 2019, Gilleleje, Denmark (poster).

Journée Système et Matière Complexes 2019, Orsay, France.

Biophysique de l'interaction racine-sol 2019, Clermont-Ferrand, France.

Teaching activity

2024-2025 **University of Exeter**, Teaching assistant

AI and data analysis for life sciences (tut. classes) in M MTH. Lecturer: K. WAN

2018-2021 **Université Paris-Saclay**, Teaching assistant

Fluid mechanics (tutorial classes) in L3 Physique. Lecturer: C. MORIZE

Experimental methods in fluid mechanics (practical work) in M1 MFL

Fluid mechanics projects (practical work) in M1 MFL

Mentoring

PhD student

2025- Angéline Girard | co-supervisor with Kirsty WAN & Harold AURADOU
University of Exeter, UK & Université Paris-Saclay, France

Undergraduate intern

May-Aug. 2017 Ariane Benoit, Polytechnique Montréal

Graduate student projects

Oct.-Nov. 2025 Lily Hartmann, University of Exeter

June 2023 Yiming Wei, Institut Polytechnique de Paris

May 2023 Alix Imard, Institut Polytechnique de Paris

May 2023 Hashmat Bakshi, Institut Polytechnique de Paris

Dec.-Feb. 2023 Rong Luo, Institut Polytechnique de Paris

Research grants

2025 Joint PhD Studentship | co-PI with Kirsty WAN & Harold AURADOU

£ 80k for a joint PhD between the University of Exeter and Université Paris-Saclay

Awards & Scholarships

2024 PhD Award | Honorable mention

awarded by the Engineering and Systems Sciences Graduate School, Uni. Paris-Saclay

2023 EuroTech Visiting Researcher Programme:

4 weeks funded at Technische Universität München (TUM), Munich, Germany

2018-2021 LabEx PALM (Physics, Atoms, Light, Matter) 3-year PhD scholarship

Administrative services

Organiser

- 2025 Physics of Life & Maths of Life Mini-Symposium, LSI, University of Exeter, Exeter, UK
2020 Journée des Non-Permanents, FAST, Université Paris-Saclay, Orsay, France

Invited seminars

- Nov. 2025 Dynamics Seminar, Exeter University, Exeter, UK
Feb. 2025 Laboratoire Jean Perrin, Sorbonne Université, Paris, France
Feb. 2025 MSC, Université Paris-Cité, Paris, France
Jan. 2025 Living Systems Institute, Exeter University, Exeter, UK
Jan. 2025 ∂ 'Alembert, Sorbonne Université, Paris, France
March 2024 Princeton University, Princeton, NJ, USA
Feb. 2024 Yale University, New Haven, CT, USA
Feb. 2024 University of Pennsylvania, Philadelphia, PA, USA
Dec. 2023 LadHyX, Institut Polytechnique de Paris, Palaiseau, France

Media outreach

Dynamique de suspensions bactériennes: de l'aérotaxie à la formation de clusters, *La Jaune & La Rouge* (Apr. 2023)

Le phénomène de la mousse de bière qui tourne à l'envers expliqué par des scientifiques, *Spirit Hunters* (09/12/2019)

Pourquoi la mousse tourne-t-elle en sens inverse du liquide dans un verre de bière ?, *L'Obs* (04/10/2018)

Counter-rotation inside a glass of beer shaken stirringly, *Improbable Research* (07/08/2018)

Bière qui roule amasse la mousse à l'envers, *Le Monde* (07/08/2018)

Quand la mousse de bière tourne à contre-courant, *Pour la Science* (26/07/2018)