Dr Grégoire Le Lay

Post-doctoral researcher at EPFL

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Research Experiences

Academic Positions

03/26 – now **Post-doctoral researcher at EPFL**, with Prof. François Gallaire
Laboratory of Fluid Mechanics and Instabilities (LFMI), EPFL, Lausanne (Switzerland)
Oscillatory instabilities in 2D flows

2026 (2 mo.) **Post-doctoral researcher at Université Paris Cité**, with Prof. Adrian Daerr
Laboratoire Matière et Systèmes Complexes (MSC), U. Paris Cité | CNRS, Paris (France)
Spontaneous Meandering of Confined Liquid Filaments

2022 – 2025 **PhD in Physics**, under the supervision of Prof. Adrian Daerr
Laboratoire Matière et Systèmes Complexes (MSC), U. Paris Cité | CNRS, Paris (France)
Nonlinear Dynamics of a Liquid Rivulet in a Hele-Shaw Cell

Academic Training

2022 – 2025 **PhD in Physics**, under the supervision of Prof. Adrian Daerr
Defended on 15/10/2025. Led to 4 first-author publications: [4, 5, 6, 7]
Université Paris Cité | CNRS

2021 – 2022 **Admission to Agrégation de Physique**
High-level competitive exam for future physics teachers (rank : 2/459)
École Normale Supérieure | Sorbonne Université

2020 – 2021 **Master 2 in Physics & Mathematics** (Nonlinear and Out of Equilibrium Phenomena)
Applied and Theoretical Mathematics (MATH) Master's degree
École Normale Supérieure | Université Paris Dauphine

2019 – 2020 **Master 2 in History and Philosophy of Science** (Lophiss)
Université Paris Diderot

2017 – 2022 **Studies at École Normale Supérieure**
Elite academic institution accessed by highly selective competitive exam in Paris, France
2017 – 2019 : **Bachelor in Physics** (L3 FIP) and **Master 1 in Fundamental Physics** (ICFP)

Research Internships

2021 (6 mo.) **Experimental study of the meandering of a liquid rivulet**, with Adrian Daerr — Laboratoire Matière et Systèmes Complexes, Université Paris Cité, Paris, France

2020 (5 mo.) **Computational analysis of leukocytes migration dynamics in complex environments**, with Pablo Vargas and Matthieu Piel — MOTILE group, Institut Curie, Paris, France
Led to 2 publications: [2] and [3]

2019 (6 mo.) **Transition to disordered front propagation in a Hele-Shaw channel**, with Anne Juel — Manchester Center for Nonlinear Dynamics, University of Manchester, Manchester, UK
Led to 1 publication: [1]

2018 (1 mo.) **Assembly of a TIRFM to study the dynamics of polymers at nanometric scales**, with Joshua McGraw — Laboratoire Gulliver, ESPCI, Paris, France

Career Breaks

2025 (1 mo.) **Paternity leave**
Birth of my daughter on 26/11/2025

Collective Responsibilities

2026 – **Youth Section of the French Physical Society board member**,
Initiatives to promote physics within the Youth Section of the French Physical Society (SFP).

2026 – **Co-organizer of the Gustins summer school**, Chambéry
One-week summer school in mathematical physics ($\sim$ 20 early-career researchers).

2023 – 2025 **Laboratory board member**, MSC
Elected representative of the PhD students and post-docs at the laboratory board of MSC.

2024 **EDPIF Scientific Day co-organizer**, Paris
Planning and supervision of a one-day event reuniting ~150 2nd year PhD students.

2023 **Young Physicists Meeting co-organizer**, Paris
One-day wide-range conference reuniting ~200 young physicists with a budget of 15 k€.

2022 – 2025 **French IPHO scientific commitee member**, French Ministry of Education
Selection and training of the French team for the International Physics Olympiads (IPHO).

Outreach

05/2025 **Pint of Science**, Paris
30-minutes intervention for the Pint of Science global science festival.

2023 – 2025 **Chaotic Waterwheel**, Université Paris Cité
Designing and building a tabletop experiment, presented at numerous occasions.

10/2023 **Science Fair**, Université Paris Cité
Presentation of scientific experiments to primary school classes.

07/2023 **SFP General Congress**, Cité des sciences et de l'industrie
Dissemination of scientific concepts at a public event.

2018 – 2019 **Cours aux ernests**, ENS
Short courses explaining the basics of physics for students in Humanities.

10/2018 **Science Fair**, ENS
Presentation of scientific experiments for the general audience.

Open Source Projects

2025 **g2ltk** — Python library for data analysis in macroscopic physics, including quantitative 2D Fourier analysis, video reading and efficient data storage. [Package] [Source code]

2024 **PyPendentDrop** — Python API (shipped with graphical and command line interfaces) to measure surface tension from images of pendent drops. [Package] [Source code] [Documentation]

2023 **Limrendir** — Free software that allows for configuring, viewing, reframing, and recording video streams from industrial GigE cameras for physics experiments. [Source code]

2021 **Tracktor** — All-in-one software for analyzing cell migration in quantitative biophysics. [Link]

Grants and Scholarships obtained

03/2025 **Scientific Mediation Call** (1 k€), Université Paris Cité
Designing and building a visual experiment to introduce chaos theory to the general public.

01/2024 **Small equipment grant** (2 k€), MSC internal call
Buying loudspeakers, cameras and lenses in order to improve an existing experiment.

06/2022 **PhD scholarship** ($\sim$ 150 k€), EDPIF competition
Funding for a 3-years PhD in France.

07/2017 **École Normale Supérieure scholarship** ($\sim$ 60 k€), ENS competitive exam
Funding for 4 years (most prestigious post-secondary scholarship in France).

Supervision & Mentoring

2026 (3 mo.) Nyall Yendell (master's student): Reproducible low-cost droplet generator
2026 (4 mo.) Matthieu Chové (master's student): Subharmonic instability of a confined cylinder
2026 (4 mo.) Mathis Ratte (master's student): Spontaneous oscillations of a jet in a cavity
2025 (2 mo.) Zacharie Leridon (bachelor's student): Pendent drop method for surface tension measurement
2024 (2 mo.) Appoline Malliach (bachelor's student): Out of equilibrium statistics of 2-D dice
2024 (2 mo.) Youtta-Maria Saad (bachelor's student): Pendent drop method for surface tension measurement

Teaching

Master's degree

2023 – 2025 **Theoretical courses**, Préparation à l'agrégation interne, Université Paris Cité
MS (2nd year) — Intensive courses in wave phenomena and electromagnetism
22.5 hETD (30 trainees / session)

2022 – 2025 **Experimental training**, Préparation à l'agrégation interne, Université Paris Cité
MS (2nd year) — Training for the experimental evaluation for candidates to the agrégation
36 hETD (15 trainees / session)

2022 – 2025 **Oral training**, Préparation à l'agrégation interne, Université Paris Cité
MS (2nd year) — Training for the oral evaluation for candidates to the agrégation
9 hETD (15 trainees / session)

2022 – 2025 **LASER**, École d'Ingénieurs Denis Diderot (EIDD)
MS (1st year) — Write and deliver 9 tutorial sessions on the physics of lasers
54 hETD (20 students / session)

2022 – 2023 **Experimental physics**, Master MEEF, Université Paris Cité
MS (1st year) — Supervision of practical work for candidates to the CAPES competitive exam
27 hETD, 15 students / session

Bachelor's degree

2026 – 2027 **Scaling Laws for Mechanical Engineers**, EPFL
Bachelor (1st year) — Supervision of tutorial sessions for first year students at EPFL
14 two hours sessions, 100 students / session

2022 – 2025 **Training for the International Physicists' Tournament (IPT)**, Université Paris Cité
Bachelor (3rd year) — Supervising and training the university's team for the IPT
43.5 hETD, 10 students / session

2020 – 2022 **Oral evaluations**, Prépa Hadamard
Bachelor (1st and 2nd year) — Oral interrogation to prepare for physics competitive exams
One hour, twice a week, 3 students / session

Volunteering

2019 – 2020 **Tutoring**, Jean Zay State boarding school
Bachelor (1st and 2nd year) — Personalized tutoring for state scholarship holders
Four times one hour a week, individual

2017 – 2019 **Tutoring**, Maison des Jeunes Talents
Bachelor (1st and 2nd year) — Tutoring for state scholarship holders
Two hours per week, 3 to 9 students / session

Publications

7 articles published in Q1 peer-reviewed journals, including **4** as first author.

In preparation

Grégoire Le Lay & François Gallaire
[9] *Floquet theory arbitrates meandering–pearling competition in rivulets*
In prep.

Submitted

Grégoire Le Lay & Adrian Daerr
[8] *Viscous Bending Mitigates the Spontaneous Meandering of Rivulets in Hele-Shaw Cells*
Submitted, preprint available — arXiv:2604.07222

Published

2026 **Grégoire Le Lay** & Adrian Daerr
[7] *Dancing rivulets in an air-filled Hele-Shaw cell*
Journal of Fluid Mechanics, 1028, A13 — 10.1017/jfm.2025.11104

2025 **Grégoire Le Lay** & Adrian Daerr
[6] *Controlling deposition and characterizing dynamics of thin liquid films with high temporal and spatial resolution*
Physics of Fluids, 37 (6), 062101 — 10.1063/5.0268672
◦ **Featured Article**

2025 **Grégoire Le Lay** & Adrian Daerr
[5] *Phase-locking parametric instability coupling longitudinal and transverse waves on rivulets in a Hele-Shaw cell*
Physical Review Letters, 134, 014001 — 10.1103/PhysRevLett.134.014001
◦ [Outreach news by Université Paris Cité]

2024 **Grégoire Le Lay**, Sarah Layani, Adrian Daerr, et al.
[4] *Magnetic levitation in the field of a rotating dipole*
Physical Review E, 110, 045003 — 10.1103/PhysRevE.110.045003
◦ **Editor's suggestion**
◦ [Outreach news by Université Paris Cité]
◦ [Outreach news by CNRS]

2023 Tania Gajardo, Mathilde Bernard, Marie Lô, **et al.**
[3] *Actin dynamics regulation by TTC7A/PI4KIIIα limits DNA damage and cell death under confinement*
Journal of Allergy and Clinical Immunology, 152, 4 — 10.1016/j.jaci.2023.06.016

2021 Sundary Sormendi, Mathieu Deygas, Anupam Sinha, **et al.**
[2] *HIF2α is a direct regulator of neutrophil motility*
Blood, 137, 24 — 10.1182/blood.2020007505

2021 Antoine Gaillard, Jack S. Keeler, **Grégoire Le Lay**, et al.
[1] *The life and fate of a bubble in a geometrically perturbed Hele-Shaw channel*
Journal of Fluid Mechanics, 914, A34 — 10.1017/jfm.2020.844

Presentations

Invited talks in conference and seminars

09/2026 **MEGA seminar**, Lausanne (ch)
Unstable Waves on a Liquid Filament

06/2026 **NLPC seminar**, Bruxelles (be)
Spatiotemporal instabilities on a liquid rivulet

06/2026 **LAUM seminar**, Le Mans (fr)
Nonlinear wave interactions on a rivulet

12/2025 **Fluids and Interfaces Seminar**, Paris (fr)
Nonlinear Rivulet Dynamics: Dancing and Meandering

10/2025 **LFMI seminar**, Lausanne (ch)
Nonlinear waves on a rivulet

08/2025 **Les Gustins Summer School**, Chambéry (fr)
Classical dissipative chaos

03/2025 **Rencontres du Non-Linéaire**, Paris (fr) — [Chosen for conference announcement]
Parametric co-amplification of waves on a rivulet

12/2024 **Matter and Complex Systems Seminar**, Paris (fr)
Parametric co-amplification of waves on a rivulet

03/2024 **Séminaire Café**, Paris (fr)
Surface wave interactions on rivulets in a Hele-Shaw cell leads to parametric destabilization

06/2023 **Non-linear physics seminar**, Paris (fr)
Acoustically-Induced Pearl Necklace Instability in Falling Fluid Rivulets

Oral contributions

10/2026 **Journées de la Matière Condensée**, Toulouse (fr)
Floquet analysis of parametrically coupled waves on a rivulet

08/2026 **Les Gustins Summer School**, Chambéry (fr)
Period-doubling cascades

07/2026 **Bifurcations and Instabilities in Fluid Dynamics**, L'Aquila (it)
Parametric Destabilization of an Acoustically Forced Rivulet

01/2025 **Journées de la Physique Statistique**, Paris (fr)
How do 2D-dice fall ?

10/2024 **Journées de la Matière Condensée**, Marseille (fr)
Parametric coupling between waves on a rivulet

09/2024 **European Fluid Dynamics Conference**, Aachen (de)
Parametric instability due to surface wave interactions on rivulets in a Hele-Shaw cell

09/2023 **European Coating Symposium**, Paris (fr) — [Chosen for proceedings cover]
Acoustically-Induced Sinuous-Varicose Coupling in Falling Fluid Rivulets

07/2023 **Congrès Général des 150 ans de la SFP**, Paris (fr)
Dancing rivulets in a Hele–Shaw cell

Poster presentations

03/2026 **Rencontres du Non-Linéaire**, Paris (fr)
Viscous Bending and Nonlinearities in Spontaneous Meandering

07/2025 **ILL Soft Matter Summer School**, Grenoble (fr)
Deposition and measurement of ultra-thin liquid layers

06/2025 **Complex Motion in Fluids**, Oléron (fr)
Parametric oscillations for a fluid rivulet

06/2024 **International meeting in the memory of Yves Couder**, Paris (fr)
Pearl necklace instability as a result of cross-coupling between longitudinal and transverse waves

03/2024 **Rencontres du Non-Linéaire**, Paris (fr)
Low-cost realization of a quantitative chaotic waterwheel

03/2023 **Rencontres du Non-Linéaire**, Paris (fr)
Dancing rivulets in a Hele–Shaw cell